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ВЫПУСКНАЯ КВАЛИФИКАЦИОННАЯ РАБОТА (ДИПЛОМНАЯ РАБОТА)

Внедрение экологического менеджмента на предприятия нефтегазодобывающей отрасли

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Рецензент _____ _____ _____

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выполнил и защитил дипломную работу с оценкой _____

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Introduction

Nowadays environmental protection is one of the priorities and its management is a rather difficult task. The main difficulty is the keeping of the rates of industrial development and minimization of the negative consequences that enterprises possess for nature. It can also be noted that international attention to the level of environmental performance steadily increases in the developed countries and large regional economic blocs in which environmental values are more actively and successfully integrated into economic development strategies.

A particular way to solve environmental problems of industrial production is considered to be environmental management. It serves as a key aspect of sustainable development and refers to the highest priorities of industrial activity and entrepreneurship. Environmental management is a safe management of modern production, which seeks an optimal relationship between environmental and economic performance. It is a structured system or environmental tool which, once implemented, helps an organisation to identify the environmental impacts resulting from its business activities and to improve its environmental performance.

Over the past decades, the structure of the economy, depreciation of major assets, increased accident rate of production and other factors have caused a significant increase in negative anthropogenic impact on the environment and natural resources. The oil and gas industry is one of the most resource-intensive and environmentally dangerous sectors of the economy. In addition, the main companies of this industry are vertically integrated, which expands the range of their negative impact on the environment: geological exploration, development of fields, production, transportation and processing of oil and gas, bringing products to consumers and its implementation, withdrawal of deposits and capacities from exploitation, and remediation of contaminated areas.

The exploitation of oil and gas reserves has not always been without some ecological side effects. Oil spills, damaged land, accidents and fires, and incidents of air and water pollution have all been recorded at various times and places. Recently, the social impact of operations, especially in remote areas like the Arctic, has also attracted

attention. There is international interest in the Arctic because vast oil and gas resources have been discovered there. Thus, it is important that companies operating in this area should do it with an appreciation to the people living there and with proper regard for the environmental and social settings.

The oil and gas industry has worked for a long time to meet the challenge of providing environmental protection. Much has already been achieved but the industry recognizes that even more can be accomplished.

Therefore, the tasks of developing and implementing scientific and technical innovations, namely, environmental management, are put forward to increase environmental safety in modern conditions at enterprises. In addition, there is implementation of energy saving and energy efficiency programs in the sphere of environmental safety, the widespread use of resource-saving, environmental, low- and non-waste technologies.

An urgent scientific task is the study of methods and the development of new mechanisms for the introduction of environmental management in the oil and gas industry based on the experience of various Russian companies working in this field.

The scientific novelty of the work is connected with the fact that on the basis of a comprehensive analysis of environmental safety aspects in the Russian oil and gas companies we will determine the ways to improve the mechanisms for regulating environmental safety in this sector.

The practical value of this study is that the theoretical provisions and recommendations contained in this thesis can be used for the implementation of environmental management in industrial enterprises, as well as for carrying out an individual approach either for the environmental authorities or for industrial enterprises in order to green their production and management. Also, this study is helpful for ensuring their environmental and economic sustainability. In addition, the results of this study can be used to develop special courses on environmental management.

Research problem:

Various aspects of the implementation of environmental management are highlighted in the works of foreign and domestic scientists. In the domestic literature, general approaches and methodology for the development, implementation and operation of environmental management systems (EMS) are considered in the works of Bobylev

S.N., Golub A.A., Guseva T.V., Zaik I.A., Ignatyeva M.N., Makarov S.V., Molchanov Ya.P., Mochalov L.A., Pakhomov N.V. Practical approaches and various aspects of the development and implementation of EMS at enterprises are analyzed in the works of Babinova Yu.V., Gabova I.Ya., Daiman S.Yu., Zuev V.I., Krupinina N.N., Pauli D., Soviakin V ., Tikhomirov N.P., Tulupov A.S., Chizhikov V., Shapkin A.S., Yaroshenko Yu.G. Environmental management is reflected in the research of foreign scientists (K. Nort, K. Richter, A. Endres, etc.) and in the practice of Western enterprises in Finland, Germany, and the United States.

Despite the large number of works the most attention in these studies was paid to assessing the impact of the company's activities on the environment (water, air, soil, noise), but environmental and economic issues that are related to the need to create environmental management system at Russian enterprises or at least to adapt existing systems of greening borrowed from the Western enterprises did not find any reflection in them. So far, issues related to the formation of a unified approach to environmental management and the mechanism for introducing an environmental management system at an industrial enterprise have been little studied, and they require further analysis. All these factors mentioned above lead to the necessity to carry out this research work.

Research purpose: To determine the ways to enhance the mechanisms of implementation of environmental management on the basis of the complex analysis of the Russian oil and gas companies.

Research object: environmental management.

Subject of research: oil and gas industry.

Research hypothesis: In this work we will try to determine the ways to enhance the mechanisms of implementation of environmental management on the basis of the complex analysis of the Russian oil and gas companies. This aim demands the statistic analysis of a big amount of data that is published on the web sites of the Russian oil and gas companies. According to the results of our study we will determine the most effective ways of implementation of environmental management in this sphere.

In order to gain these results we are going to use the following methods in our study: system analysis of data, modeling method, methods of the logical, mathematical, technical and economic and factorial analysis.

Aims of research (according to the chapters).	Methods of research
1. To conduct a comparative analysis of the results of solving the optimal control problem, found by different methods.	Logical, mathematical, technical-economic and factor analysis
2. Experimentally show the effectiveness of the proposed algorithm that implements the technology of greening.	Modeling method
3. Develop mechanisms for implementation of environmental management in oil and gas enterprises.	System analysis, modeling method

The expected results of the study:

1. The comparative analysis of the results of the solution of a task of different optimum control methods is carried out.
2. Efficiency of the offered algorithm realizing technologies of greening is experimentally shown.
3. Mechanisms of implementation of environmental management at the oil and gas production enterprises are developed.

1. ENVIRONMENTAL MANAGEMENT IN THE RUSSIAN OIL AND GAS ENTERPRISES

1.1 Concept of environmental management

Environmental management is management of organisation's activities that have or may have an impact on the environment. It is a continuous cycle of planning, implementing, reviewing and improving the process and actions that an organisation undertakes to meet its environmental targets and requirements. Environmental management system (EMS) is also a system that complies with the requirements of international standards such as ISO 14001 and EMAS which is the part of the overall management system that includes organisational structures, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, reviewing and maintaining the environmental policy [Weib].

An EMS manages the environmental impacts of an organisation. The expected outcome of which is continuous improvement in environmental management [Weib].

EMS standards are kept very general because they are intended to be applicable in many or even all over the world. However, organisations that implement an EMS can adapt their EMS exactly to their needs. Organisations that do not have sighnificant environmental impacts themselves can focus their EMS on the environmental performance of suppliers, while organisations with significant environmental impacts can focus on operating more environmentally friendly [Weib].

Both the ISO 14001 standard and EMAS only specify the structure of an EMS. The content is up to the organisation itself. The organisation decides what it wants to do, and the EMS organises the proces. If the organisation focuses the EMS on specific operational practices then operating costs can be reduced and environmental risks minimized. The objectives for improvement are set by the organisation itself [Weib].

ISO 14001 is not the only environmental management system scheme existing in Europe. A second scheme, the eco-management and audit scheme (EMAS) that has been operating since 1993 [Hunt].

Differences between ISO 14001 and EMAS are the following:

- Whereas ISO 14001 is applicable worldwide, only EU member states can participate in EMAS.

- Unlike ISO 14001, EMAS is not a standard but a Regulation (A Regulation is a type of EU legislation).

- While a whole company, a specific site or a specific activity can be certified to ISO, only individual sites can be registered under EMAS.

- Whereas ISO 14001 is applicable to all organizations, only companies performing industrial activities specified in the EMAS Regulation can participate in EMAS.

- When ISO 14001 only contains requirements for an environmental management system, the EMAS regulation contains requirement for an environmental management system, requires a firm to produce an environmental statement, and requires that a firm's EMS and statement be independently verified [Hunt].

EMAS demands a firm to produce an environmental statement that describes the firm's environmental management system and its environmental performance. The statement must be publicly available and must include the following: a description of the company's activities at the relevant site; an assessment of all the significant environmental issues of relevance to the activities concerned; a summary of the figures on pollutant emissions, waste generation, consumption of raw materials, energy and water, noise and other significant environmental aspects as appropriate; other factors regarding environmental performance; a presentation of the company's environmental policy, programme and management system implemented at the site; the deadline set for the submission of the next statement; the name of the accredited environmental verifier [Hunt].

ISO 14000 consists of an evolving series of generic standards developed by the International Standards Organisation (ISO), that provides business management with the structure for managing environmental impacts. The standards include a broad range of environmental disciplines, including the basic management system (14001); auditing (ISO 14010); performance evaluation; labelling (ISO 14020 and 14024); life-cycle analysis; and product standards. Any of these standards can be used in its basic form or be further adapted and implemented into national standards system [UNEP].

An EMS is a systematic approach for an organisation to achieve environmental and other organisational goals. Since organisations of all kinds increasingly want to achieve and demonstrate sound environmental performance, an EMS can help to comply with environmental laws and regulations as well as with expectations from customers and other stakeholders. It can compound an organisation's organisational goals with its environmental goals and enable environmental obligations to be managed effectively. Moreover, an EMS can manage potential liabilities by systematically identifying risks and avoiding environmental and financial damages [Weib].

Some of the numerous benefits of an EMS are: improved environmental performance, enhanced compliance, prevention of pollution, resource conservation, new customers/markets, increased efficiency/reduced costs, enhanced employee morale, enhanced image with the public and investors/stakeholders, employee awareness of environmental issues and responsibilities, reduced liabilities, competetive advantages, fewer accidents [NFS International].

Generally, the cost of implementation of EMS depend on the amount and nature of an organisation's environmental impacts, on the existatnce and stage of development of environmental management in the organisation, and the speed at which implementation is undertaken. However, it is possible to distinguish between both internal and external costs caused by implementing an EMS. Internal labour costs, for both managers and other employees, are the greatest cost for most organisations. The costs can also include: staff time spent establishing and maintaining the system; payment of consultants, if used to help establish the system; payment of ISO 14001 certifier/EMAS verifier [NFS International].

External costs mainly occur during the process of implementation of an EMS and possibly also no further external coaching of the improvement process after certification. These exteral costs include: outside staff training, consultant fees, in-house trainig and specialized training costs, certification costs, internal manpower costs, investment costs for improving environmental performance (depending on the targets set up in an environmental management programme) [Weib].

Usually the implementation of an EMS brings more benefits than costs. In any case, in order to help to avoid unexpected surprises, the potential costs of implementation need to be evaluated before the process starts. An EMS is often built on existing

production or quality management systems. When such systems are weak, ineffective or simply do not exist, then there is a need to establish a better management framework before focusing on the details of the EMS [Weib].

While there are obviously costs involved in setting up and operating an environmental management system, the system can also bring great benefits. A firm should establish an environmental management system if it believes that the benefits from doing so will overbalance the costs involved [Hunt].

The profit that arises from establishing of EMS is impressive. An EMS takes a systematic approach to environmental management and a systematic approach is a cost-effective approach. The environmental review highlights all the areas of the firm where improvement in performance is needed. With this information, a firm can assess which improvements will produce the greatest benefits in terms of cost savings and reduction of risk, and deal with these areas first. The firm can then set targets that benefit both itself and the environment [Hunt].

An EMS not only requires companies to set themselves targets but ensures that they meet them. A company must organise a management programme for achieving its targets, make sure that the resources are available for it to be carried out, monitor its environmental performance to check if it has met its targets and take corrective action if it finds it has not [Hunt].

As well as bringing about a continual improvement in environmental performance, an EMS enables a firm to ensure it is complying with relevant legislation and regulations. The environmental review considers all the legislation and regulations with which the firm should be complying and then the firm must establish procedures for checking compliance and for taking corrective action wheathe it should discover instances of non-compliance [Hunt].

ISO 14001 and EMAS not only enable a firm to meet its environmental policy commitments and its objectives and targets, they also enable the firm to demonstrate sound environmental management to stakeholders. There may be considerable public relations benefits and increased market opportunities for a firm that can demonstrate to the outside world that it has a sound system of environmental management [Hunt].

Having a management system can mean less supervision from environmental regulators and preferential treatment from banks and insurers. And the fact that an EMS demonstrates good environmental management may also improve company's ability to attract investment [Hunt].

An EMS encourages an organization to continuously improve its environmental performance. The system follows a repeating cycle. The organization first commits to an environmental policy, then uses its policy as a basis for establishing a plan, which sets objectives and targets for improving environmental performance. The next step is implementation. After that, the organization evaluates its environmental performance to see whether the objectives and targets are being met. If targets are not being met, corrective action is taken. The results of this evaluation are then studied by top management to see if the EMS is working. Management revises the environmental policy and sets new targets in a revised plan. The company then implements the revised plan. The cycle repeats, and continuous improvement occurs [epa.gov].

The most commonly used framework for an EMS is the one developed by the International Organization for Standardization (ISO) for the ISO 14001 standard. Established in 1996, this framework is the official international standard for an EMS which is based on the Plan-Do-Check-Act methodology. The five main stages of an EMS are: commitment and policy, planning, implementation, evaluation and review [epa.gov].

Oil and gas development activties are expected to grow and be carried out safely with minimum adverse environmental impact, only through a strong company commitment to environmental protection. The government also needs to have a solid understanding of exploration and production operations and how they may affect the environment. The activities on both sides should be complementary to achieve the most-effective and environmentally friendly approach. It is generally acknowledged that this approach:

- Systematically integrates environmental issues unto business decisions through the use of formal management systems;
- Integrates health, safety and environmental management into a single programme;
- Considers all environmental components (air, water, soil, etc.) in decision making at strategic and operational levels;

- Prevents waste at its source through pollution prevention techniques and making maximum re-use of waste components, rather than installing expensive treatment for discharges;
- Evaluates alternatives on a cost/benefit/risk basis that includes environmental values;
- Aims at minimizing resource inputs;
- Innovates and endeavours for continual improvements [UNEP].

Both EMAS and ISO 14001 require companies to carry out an environmental management system audit. This means that a company must check to see whether its environmental management system fulfils the requirements of these documents [Hillary].

An environmental audit is a tool that is used to check whether a company is doing what it should be doing. Environmental auditing originated in North America in the 1970's as a management tool to ascertain whether or not companies were complying with the increasingly numerous and complex laws and regulations that were coming into force at that time. Checking whether the activities of a company that are covered by environmental legislation actually comply with that legislation is called a legislative compliance audit [Hillary].

Perhaps a company has a waste management policy, or has agreed to abide by its industry sector guidelines on waste management. In this case the company may want to carry out an audit to check that its waste management activities conform with the requirements of its policy or the industry sector guidelines. Or maybe a company has in place certain procedures for carrying out important operations. In this case the company may want to carry out an audit to check that the relevant staff members are adhering to these procedures [Hillary].

Maybe a company decides to purchase another company. In this case it may want to do a preacquisition audit to check, for example, that this company is doing what it should be doing in terms of complying with all relevant legislation and any industry guidelines which it has signed up to [Hillary].

Environmental indicators express useful and relevant information about a firm's environmental performance and its efforts to influence its performance. So what is environmental performance? Environmental performance can be defined as, 'the results of an organization's management of its environmental aspects' and, as

noted in before, an environmental aspect refers to, ‘an element of an organization’s activities, products or services that can interact with the environment’ [Morrison-Saunders].

Examples of indicators include: tonnes of SO_2 released per year, tonnes of CO_2 released per unit of production, litres of water used per year, kilogrammes of hazardous waste produced per year, number of legislative breaches per year, savings achieved through energy efficiency measures, number of environmental improvement suggestions from employees and number taken up by management, number of complaints received about environmentally related matters, number of employees trained versus number needing training [Morrison-Saunders].

To estimate and evaluate the environmental impact caused by the production processes, Environmental Accounting (EAc) and Cleaner Production (CP) are frequently used. The CP methodology is quite similar to the guidelines for Environmental Accounting (EPA, 1995). This outlines procedures for conducting a preliminary assessment to identify opportunities for waste reduction or elimination. Further it describes how to use the results of this preassessment to give priority to areas for detailed assessment, how to use the detailed assessment to develop pollution prevention options, recycling and recovery, and how to implement those options that withstand feasibility analyses. However, there is no environmental impact assessment evaluations built into this method [Morrison-Saunders].

Environmental performance evaluation (EPE) is the process that organizations can use to measure, analyze and assess their environmental performance against a set of criteria. EPE helps to understand what their environmental aspects are, and determines what their significant environmental aspects may be. This lets the organization form a baseline from which objectives and targets for improvements can be derived. Therefore EPE is central to improvements of environmental performance and to compare an organization’s performance against another similar organization (benchmarking). An organization that is committed to improving its environmental performance needs to be able to measure its performance level. With the help of Environmental Performance Indicators (EPIs) a company will be able to do so. An EPI should reflect changes over a period of time, be reliable and

reproducible, and be calibrated in the same terms as the policy goals or aims they are linked to [Morrison-Saunders].

UNEP defines Environmental Impact Assessment (EIA) as a tool used to identify the environmental, social and economic impacts of a project prior to decision-making. It aims to predict environmental impacts at an early stage in project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the predictions and options to decision-makers. By using EIA both environmental and economic benefits can be achieved, such as reduced cost and time of project implementation and design, avoided treatment/clean-up costs and impacts of laws and regulations. Although legislation and practice is different around the world, the fundamental components of an EIA would necessarily include the following stages:

- Screening to determine which projects or developments require a full or partial impact assessment study;
- Scoping to identify which potential impacts are relevant to assess (based on legislative requirements, international conventions, expert knowledge and public involvement), to identify alternative solutions that avoid, mitigate or compensate adverse impacts on biodiversity (including the option of not proceeding with the development, finding alternative designs or sites which avoid the impacts, incorporating safeguards in the design of the project, or providing compensation for adverse impacts), and finally to derive terms of reference for the impact assessment;
- Assessment and evaluation of impacts and development of alternatives, to predict and identify the likely environmental impacts of a proposed project or development, including the detailed elaboration of alternatives;
- Reporting the Environmental Impact Statement (EIS) or EIA report, including an environmental management plan (EMP), and a non-technical summary for the general audience.
- Review of the Environmental Impact Statement (EIS), based on the terms of reference (scoping) and public (including authority) participation.
- Decision-making on whether to approve the project or not, and under what conditions; and

- Monitoring, compliance, enforcement and environmental auditing. Monitor whether the predicted impacts and proposed mitigation measures occur as defined in the EMP. Verify the compliance of proponent with the EMP, to ensure that unexpected impacts or failed mitigation measures are identified and addressed in a timely fashion [UNEP].

1.2 Environmental management in Russia

Nowadays energy demand is very high so the need for oil and gas is at an all-time high. Global oil demand is predicted to increase by more than a third by 2035.With this energy demand, the oil and gas industry is being challenged to increase production efficiencies in its crude oil and natural gas resources. The ability of the industry to address a number of operational challenges will be crucial in ensuring that future demand is met with adequate supply [White Paper].

During recent years, oil and gas companies have made profound investments in their safety and environmental functions. These investments have made the companies' safety and environmental systems more advanced, and have enabled the companies to become much more ambitious in their safety goals. Indeed, it 's not unusual for oil and gas companies nowadays to have an aim to zero injuries and fatalities. For most companies, however, this goal has remained difficult to achieve. Even if fatalities only happen at a fifth or a tenth the rate of 20 years ago, they still happen [Clark, Verity, Landau].

The Russian Federation is one of the world's leaders by oil and gas reserves and production. Today, Russia produces one seventh of primary energy resources of the globe. There are 12.9% of world's explored reserves of oil and 36.4% of gas. The economy of our state greatly depends on efficiency of oil and gas producers. Oil and gas production is rather a complicated and long process from field search to raw material transportation to a processing or consumption facility. At any stage, the entire complex of specialized equipment is used assuring volume of crude materials, people safety and environmental security [mir-forum.ru].

Environmental management in Russia faces severe problems, both from Soviet-era and continuing environmental degradation and due to the weakness of current institutions with responsibilities for environmental protection.

The Russian Federation possesses one-third of the world's known natural gas reserves and is one of the major oil-producing countries in the world acording to the International Energy Agency. It also has plentiful technical expertises to manage and protect these resources, and nongovernmental organizations of scientifically sophisticated activists that are willing to preserve them. However, ecological conditions continue to fall into decay in many geographic areas and economic sectors, resources decrease, and resource productivity declines. Environmental policymaking is not pervasive and many of the institutions responsible for it are lacking stability. All these factors lead to an environmental failure of oil and gas idustrial sectors in Russia [Wernstedt, p. 4].

The biotic and geopolitical importance of our country and the potentially destabilizing effects of poor environmental management in enterprises make the state of the Russian environment a global concern. The main sources of water, air and soil pollution are oil and gas industries [Wernstedt, p. 4].

All over the country, oil and gas enterprises have largely been privatized—the government share in major Russian oil companies is about 25%—but new capital investment in oil extraction and refining and labor and capital productivity are considerably low in comparison to other countries [McKinsey Global Institute, 1998].

Western Siberia is one of the oil- and gas-richest areas that is important to the national economy providing government revenues and export earnings. However, the decades of energy extraction in this region have clearly degraded its environmental conditions. Water bodies are directly contaminated from spilled oil and brine along pipelines and is readily observable at well sites, native forest cover is heavily stressed with constructions and logistics, local air quality has deteriorated, and development at extraction sites, access roads, and towns has significantly effected the hydrology of the area. These changes have had negative influence not only on the environment but even on local residents and industrial workers. For example, 74 percent of the region's 300 plus respondents to the RLMS perceive that chronic illnesses in their families are due at least in part to poor environmental conditions [Mroz et al., 2001].

Nizhnevartovsk that is in the Khanty Mansi autonomous region—a region that accounts for roughly onehalf of Russian oil production – also faces ecological brakedown. It has been estimated that from 92 to 98% of the volume extracted from the field is water due to past efforts to reinject water to maximize the volume of recovered oil [Personal Communication, Nizhnevartovsk Environmental Committee, 1996; The Economist, 2001]. This brings an intimidating environmental problem: once the water is separated, it receives inadequate treatment and often is discharged to receiving surface waters [Wernstedt, p. 8].

Oil and gas industries usually have limited funds to invest in technology upgrades and pipeline maintenance. While state-owned monopoly are improving gas pipelines and oil trunklines the field pipelines that are owned by local producers need better maintenance. For example one quarter of Nizhnevartovsk's 11,000 kilometers of pipeline infrastructure need to be replaced every year, yet many local producers have insufficient revenues to fund this maintenance. [Sagers, 2000].

Other difficulties that Russian oil and gas industry is faced with are high capital costs and barriers to foreign investment arising from the uncertainty of production-sharing legislation, shareholder protection, and restrictions on imported physical capital limit the upgrading of production and transport facilities. Ths underinvestment may lead to oil spills and pipeline leaks that have influence local environment [Wernstedt, p. 10].

Population around oil and gas developing sites grow or at least remain rather stable. For example the population of the city of Nizhnevartovsk increasing from roughly sixteen thousand residents in 1970 to nearly 250,000 residents in the mid-1990s and stabilizing or dropping only slightly since then. However, funds for infrostructer are limited and dicrease even more. This leads to the drinking water and wastewater problems because not everyone can afford battled or filtered water that causes gastrointestinal illnesses [Wernstedt, p. 13].

Russian enterprises operate at a considerable distance from a competitive market economy, in the sense that economic relations, even for private enterprises, are dominated by barter, negotiation over favorable tax treatment, unstable interenterprise contractual arrangements, tight social obligations to local communities, and other factors that are the antithesis of a wellfunctioning, competitive market economy. Investments in physical capital to promote maximum production efficiency and profit and environmental

protection are sufficiently low. On the other hand the investments go to goodwill with local, regional, and federal authorities — by providing services, bribes, or other favors that later can be used to secure favorable treatment [Wernstedt, p. 17].

Even when economic incentive schemes work, the incentives may be too low to make a difference. For instance, the Nizhnevartovsk Environmental Committee issued 80 fines for nearly $2.5 million to polluting enterprises in 1995 (the latest year for which figures are available) that was supposed to be spent for the oil pipeline spills. Many of these fines were never collected, but even if they had been, their low-level cost relative to mitigation costs meant their revenue raising properties always would prevail over changing behavior and improvement of environmental quality. This is a spreadinge problem throughout Russia, one that bedevils both the use of incentives and the threat of enforcement in environmental media resources [Wernstedt, p. 17].

Environmental monitoring, a staple of enforcement, is difficult in Russia because of the expanses that come from the vastness of the territory. Each station in the water quality monitoring network in Russia averagely covers an area greater than 9,000 square kilometers, with stations in the more isolated parts of central and eastern Russia covering areas more than 250,000 square kilometers. Moreover, monitoring traditionally is not set up to meet effluent standards. The vast and sophisticated network of the national hydrometeorological and environmental monitoring system (Roshydromet), for example, focuses on surface ambient conditions and long-term forecasts of environmental conditions, rather than on effluent quality [Zhulidov et al., 2000]. This meets the purposes of the monitoring of environmental outcomes though is not particularly suited for determination of site-specific discharge violations [Wernstedt, p. 19].

There is always a variety of potential risks and negative impact on the environment because of oil and gas exploration. Consequences depend upon the stage of the process, the size and complexity of the project, the nature and sensitivity of the surrounding environment and the effectiveness of planning, pollution prevention, mitigation and control techniques [UNEP, p. 17].

Exploration of oil and gas bring first of all economic, social and cultural changes into the areas of its performance. It affects local groups and indigenous peoples as well. It brings changes into land-use patterns, logging, hinting, fishing, social structure and organization, employment opportunities and income differentials, infrastructure and

transportation. There are of course positive changes like improved infrastructure, water supply, sewerage and waste treatment, but there are also unpredicted consequences that can arise in case of improper management and planning [UNEP, p. 18].

The emissions from oil and gas industry are related to global issues such as stratospheric ozone depletion and climate change. The main emission gases are: carbon dioxide, carbon monoxide, methane, volatile organic carbons and nitrogen oxides. Ozone depleting substances are used in some fire protection systems, principally halon, and as refrigerants. Approximately 10 % of world methane emissions are from oil and gas industry. Industry is improving the processes of gas emissions and these emissions are actually decreasing though there is still place for improvement [UNEP, p. 19].

Water pollution occurs because of the processes such as: spills, leakage, sewerage, sanitary and domestic wastes, drilling and drainage. The high pH and salt content of certain drilling fluids and cuttings poses a potential impact to fresh-water sources. Produced water is the largest volume aqueous waste arising from production operations, and some typical constituents may include in varying amounts inorganic salts, heavy metals, solids, production chemicals, hydrocarbons, benzene, PAHs, and on occasions naturally occurring radioactive material [UNEP, p. 20]. There are also negative terrestrial and ecosystem impacts that also need more regulation and investments.

Russia is one of the five “coastal” countries that are particularly interested in the Arctic territories because of the oil and gas deposits. The Arctic includes the territories of eight countries, five of which are considered to be “coastal states”, namely, the Russian Federation, United States of America, Canada, Norway and Greenland (Kingdom of Denmark). Although the Exclusive Economic Zone (EEZ) of Iceland is within the Arctic, its landmass lies just to the south of the Arctic Circle. Sweden and Finland do not have coastlines within the Arctic [OGP].

The Arctic is currently the source of about 10 per cent of the world’s oil production and 25 per cent of the world’s gas production (USGS, 2008). Russia is currently the major contributor of the Arctic oil (80 per cent) and gas (99 per cent) to world production (AMAP, 2007). The largest volumes of Russian oil and gas are from the onshore Timan-Pechora and West Siberian basins. Within its Arctic basins, Russia holds over 75 per cent of the known oil and over 90 per cent of the known gas reserves. Russia expects to start its first Arctic offshore oil production in 2012 or 2013 from the

Prirazlomnoye field in the Pechora Sea. In the future, gas and condensate are likely to be produced from the Shtokman field in the Russian Barents Sea [OGP].

The oil and gas industry has decades of experience in developing the oil and gas resources of the Arctic; onshore production started in the 1920s and offshore production in the 1970s. To date, significant volumes of oil, gas and natural gas liquids have been produced, primarily from the West Siberian Basin and North Slope of Alaska, and more recently from the northern Norwegian Sea (AMAP, 2007).

The hydrocarbon basins in the Arctic are thought to hold a significant proportion of the world's remaining undiscovered hydrocarbon reserves (USGS, 2008) and continue to be explored by oil and gas companies and resource owners [OGP].

The International Association of Oil & Gas Producers (OGP) has actively contributed to the development of Arctic standards or guidelines for environmental protection. OGP (and its predecessor E&P Forum) published Oil & Gas Exploration and Production in Arctic and Sub-Arctic Onshore Regions – Guidelines for Environmental Protection (OGP, 1993), and Oil & Gas Exploration & Production in Arctic Offshore Regions – Guidelines for Environmental Protection (OGP, 2002). OGP is currently coordinating a joint industry project on Arctic oil spill response technology. IPIECA (the global oil and gas association for environmental and social issues) along with the American Petroleum Institute (API) is developing complementary guidance on oil spills in ice [OGP].

Recognising the advances in design, technology and operational practice, along with the increased interest and experience in Arctic oil and gas and the need for the highest level of environmental protection, OGP is updating its two OGP Environmental Guidelines documents in this consolidated Good Practice Guide (GPG) [OGP].

Development of oil and gas in the Arctic faces many social and environmental challenges. The pace and location of future development will be determined by a number of factors including acceptability to society, a continuing demand for hydrocarbons, viable economics, favourable regulatory regimes, technology development and the safety and wellbeing of employees and communities. Operators will continue to be responsible to the wider society for demonstrating that risks are recognised and managed [OGP].

International and national operator and contractor organisations facilitate communication and knowledge sharing between industry sectors and with external

organisations. The industry is represented by: International Oil and Gas Producers Association (OGP); IPIECA, the global oil and gas industry association for environmental and social issues; International Association of Geophysical Contractors (IAGC); International Association of Drilling Contractors (IADC) OGP also maintains formal links with shipping and other industries: Oil Companies International Marine Forum (OCIMF), International Marine Contractors' Association (IMCA) [OGP].

OGP also represents member companies in discussions with organisations including the International Maritime Organization (IMO), International Whaling Commission (IWC), International Union for the Conservation of Nature (IUCN) and relevant Non-Governmental Organisations (NGOs). OGP maintains formal and informal links with the Arctic Council and its Working Groups. An increase in cross-sector and business forums to discuss future Arctic developments is expected [OGP].

Physical conditions in the Arctic with regard to oil and gas development are changing. Changes in weather and oceanographic patterns have had consequences over various timescales for example for sea ice cover, sea level, iceberg calving, coastal erosion and permafrost integrity. Seasonal loss of ice cover has been projected on various time scales [OGP].

Changes in the maritime environment have implications for the construction and operation of offshore facilities, and the associated export routes for hydrocarbons. Changes to the terrestrial environment may influence the construction and operation of landbased facilities [OGP].

The oil and gas industry designs its facilities for extremes of weather in areas where it operates and this is also true for Arctic conditions. As it pursues its Arctic strategy, the oil and gas industry is monitoring closely the future changes in the Arctic and will adopt appropriate practices to ensure safe design for foreseeable conditions [OGP].

There is a binding legal regime that applies in the Arctic under the UN Convention of the Law of the Sea (UNCLOS, 1982). In addition, many international treaties apply to the Arctic and several bi-lateral treaties have been established between Arctic nations. Signatories to these conventions apply the provisions via their domestic legislation [OGP].

Some significant International Conventions that apply to the Arctic include: Vienna Convention for the Protection of the Ozone Layer; Montreal Protocol on Substances that Deplete the Ozone Layer; Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; United Nations Framework Convention on Climate Change; Kyoto Protocol to the United Nations Framework Convention on Climate Change; United Nations Convention on Biological Diversity; Stockholm Convention on Persistent Organic Pollutants [OGP].

1.3 Risk management

Risk management is an integral part of day-to-day business activities in the energy industry. Oil and gas companies face risks rang in from volatile commodity prices, which are less linked to basic supply and demand but more to global socioeconomic factors, to increased health, safety, and environmental pressures resulting from past and recent major accidents negatively impacting the environment, industry image, and its social lease.

However, risks related to asset damage, business interruption, pollution, injuries to people, and damage to properties is intrinsic in normal oil and gas activities. Then there are the additional risks of non-compliance and of major cost overruns for large construction projects so common in today's industry. These are just a few examples of the serious risks and threats that can impact oil and gas companies. Technology can help mitigate these risks.

The upstream oil and gas industry manages a wide range of risks, including political, societal, asset integrity, commercial, reputation, safety and environment. Risk management for Arctic conditions has to follow a structured approach to: identify hazards and effects that may arise from routine, emergency and past activities; assess significance, taking into account probability and consequences; document each risk (eg in a risk register) with applicable legal and other standards; establish realistic and achievable objectives and performance criteria; define risk reduction measures that are suited to Arctic conditions [OGP, 2007].

Risks may be identified at different levels by an organisation. While entering the Arctic, top management should take into consideration the special challenges of

operating in the Arctic when evaluating the company or venture risk profile and defining its Arctic strategy. Project and operational risks are typically identified within a project or asset team as part of the environmental and social impact assessment process. The environmental hazards, their likelihood and consequences should be regarded according to Arctic conditions. In support of its Arctic strategy, an operator should maintain and implement plans for achieving its objectives and meeting its performance criteria.

Site design should incorporate adequate interception systems to minimise damage from minor incidents and fugitive sources. Although the risk of major oil spills from properly managed operations is low, maintaining effective containment and clean-up measures are essential [OGP, 2007].

All activities, including seismic studies and exploration drilling, and sites such as camps, pipelines and transportation routes, should have adequate contingency plans in place to deal with spills, not only of oil but also fuel, chemicals and hazardous materials. Plans should be based upon the risk, location, volume and type of potential spill. The type of spill response equipment, manpower and organisation required to effectively respond to incidents, both large and small, should be included in the plan, together with the identification and protection of vulnerable and sensitive areas[OGP, 2007].

The plan should clearly identify the actions necessary in the event of a spill: the communications network, the organisation structure and the individual responsibilities of key emergency personnel, together with the procedures for reporting to the relevant authorities. The plan should deal with disposal of recovered material, contaminated waste and debris generated by the spill, and the transportation and housing of support personnel brought in for clean-up activities. The plan must be exercised and reviewed periodically to ensure its adequacy, and personnel trained to be competent in fulfilling their expected roles and responsibilities, as an oil spill is one of the main dangers for the Arctic environment [OGP, 2007].

Oil spills can enter streams and rivers, although the presence of surface water is limited seasonally in the Arctic. The presence of groundwater should be a main concern in relation to spills outside of the permafrost areas. In northern regions, even if appropriate technology is available, oil spill counter measures may be more difficult to cope with due to extremely cold temperatures, the presence of ice, long periods of darkness, intense storms and lack of support facilities. The movement, velocity and

stability of the ice can also be a factor, as can water temperature, current strength and wind speed [OGP, 2007].

Equipment resources that should be available for oil spill response may include: landing craft, barges, tugs, fishing vessels, dredges, igniters, lightering vessels and pumps, tenders, helicopters, fixed-wing aircraft, booms, stationary skimmers, advancing skimmers, sorbents, earth-moving equipment, pressure washers, vacuum trucks and waste storage containers. If chemical dispersants are used, it is important to choose those that are effective, have low toxicity, that do not have a tendency to bio-accumulate and that are biodegradable. Prior approval for their use in such emergencies should be obtained where there is such a statutory requirement. Manpower resources should be described in the contingency plan [OGP, 2007].

Implementing and using Risk Management is a necessary and growing activity in today's unstable economy. The Committee of Sponsoring Organizations defines Risk Management as a process affected by an entity's board of directors, management and other personnel; this process is applied within a corporation, designed to identify potential events which may affect the entity and manage risks to be within its risk appetite. In addition, Risk Management is a process that provides reasonable assurance regarding the achievement of the company's objectives. Companies can identify, assess, respond, and monitor the outcomes of the corporation's leading risk factors with an Enterprise Risk Management system in place.

It is od great importance that oil production companies take strategic risks. Energy exploration and production (E&P) companies must employ new ways to find and extract reserves; otherwise, all of their revenue is generated from a product with a quantity that is finite and decreases over time. To stay afloat, E&P companies must grow their revenue bases by acquiring or finding new reserves. The most recent way of doing that has been via shale formations. In fact, the output of rigs in shale formations account for virtually all oil production growth in Russia and abroad. This, of course, is part of the phenomenon known as "fracking": extracting oil from underground rocks by blasting them with a mixture of sand, chemicals, and water [apqc.org].

Many of the E&P enterprises that invested in fracking were less stable than other companies. In 2013 more than a quarter of all shale investment was done by firms with debts of more than three times their gross operating profits. With a break-even point of

$70 per barrel and current oil prices dipping below $50 per barrel, many of these operations will likely go bust [apqc.org].

Situations that should have been considered involve emerging risks (ones that could affect an organization's financial strength, reputation, or competitiveness) have come to fruition in the last few months, including: political obstacles, increased supply, decreased demand, power players, foreign policy, declines in output [apqc.org].

Effective enterprise risk management (ERM) programs consist of tools for the top executives of the company to use to ensure they know what threats are out there and what those threats could mean in terms of shareholder value and market capitalization [apqc.org].

Best-practice organizations have primary goals of ensuring sound risk planning by focusing senior management and boards on risks that are capable of affecting strategy; creating value for key stakeholders by ensuring beneficial execution of strategy; ensuring that risks are properly identified, assessed, monitored, and mitigated; and creating a risk-intelligent culture to keep decision makers engaged in the process [apqc.org].

Companies that have foreseen this oil boom and/or bust, or at least have put in place a stop-gap strategy to prevent conditions of getting worse, will likely bounce back faster than those who have not. Those who have considered new rounds of innovation in drilling, standardization, and techniques for fracking may be put in a better position once prices eventually rebound. They will be back up to speed much faster than the ones still recuperating from this wild ride [apqc.org].

In the oil and gas industry, managing capital projects, in particular large capital projects, in a global environment is becoming increasingly complex. This is especially the case as large reserves are being depleted and the industry copes by drilling multiple smaller wells to compensate [Bigliani].

Oil and gas companies need to make strategic decisions about which projects should be developed first to ensure their company's best performance. Then there are decisions about equipment resources: When is the best time to reserve a rig? Should the decision be based on getting the best rate even if the rig will not be needed at that exact moment? Or should a firm wait until the exact date for a drilling project is known and risk the equipment not being available, or the threat of higher rental rates? How does an equipment shortage impact planned revenues? Do key decision makers have the ability to

review this information and prioritize projects based on equipment resources? The same resource issues are faced for human capital tied to exploration and production (E&P) projects. Are the appropriate teams in place for a project, or has an unexpected failure at another location impacted the project? [Bigliani].

As a result, the project portfolio needs to be dynamically managed as a process, in which the list of projects can be constantly revised, and new projects evaluated, selected, and prioritized based on parameters of importance to the company such as level of risk, expected return on investment, economy considerations, etc. Existing projects can be accelerated, stopped, or reprioritized, and resources can be allocated and reallocated to the most appropriate active projects as needed [Bigliani].

The oil and gas industry is operating in increasingly remote geographical locations and harsher environmental conditions, with unconventional processes to extract hydrocarbons. Joint collaboration between large producers on risky international exploration and production (E&P) projects is common. Articulated E&P sharing agreements with multiple stakeholders need to be managed. High rates of non-productive time demand action, and overall equipment efficiency needs to grow [Bigliani].

All in all, companies share the same primary goal of needing to produce hydrocarbon as efficiently and cost effectively as possible. One strategy for achieving this has been the adoption of a "digital oilfield" or "integrated operations" to enhance reservoir recoverability, optimize production, and reduce economic, environment, health, and safety risks. Initially this strategy was only associated with upstream, but companies are increasingly focused on accessing and managing key asset-related data to improve decision making across the entire enterprise from field to refinery [Bigliani].

Light, sweet crude oils are in short supply, and the less expensive heavy, sour crudes are more plentiful worldwide. However, not all refineries are currently configured to handle the heavier oils. Refiners need conversion capacity for hydro-skimming, cracking, and coking to capitalize on the sour crude discounts. At the same time, stricter fuel standards have forced refineries to retool to be able to accommodate new fuel mix requirements, especially in North America and Europe [Bigliani].

Another challenge lies in having the right crude available based on the demand pattern for products. Refiners must make decisions about whether to buy crude of the quality needed to meet the forecast demand for specific products and put this crude in

storage or wait to buy the crude on an as-needed basis. If a company receives the crude on time, the plant must make decisions on how to blend based on the margin for that product. One other aspect is how processing heavy oil impacts emissions at the plant. In response to the changing properties of crude, refiners are responding with initiatives to increase their flexibility of production and see this as a major competitive advantage [Bigliani].

A shortage of expert resources is not new to the industry. This problem has existed for several years. Shortages are mainly in the highly technical areas such as geology and geophysics and petroleum engineering. In some geographies there is also a shortage of IT personnel with expertise in some of the more complex information technologies, such as high-performance computing (HPC), used to support analysis of large volumes of scientific and engineering data in exploration and production [Bigliani].

The industry has always been involved in efforts related to critical infrastructure protection. However, with the progressive digital evolution toward smart oilfields and refineries of the future, IT and OT security has been receiving greater attention. Concerns were originally raised about the security of process systems with the revelation that the highly sophisticated Stuxnet virus is capable of invading process control systems, and potentially disrupting processes by invading control systems on drilling rigs and in the refinery. More recently the cyber attacks on Saudi Aramco and RasGas were a huge shock for many oil and gas organizations in the Middle East region [Bigliani].

The world's largest oil-producing company, Saudi Aramco, was the victim of a significant cyber attack on August 15, 2012. The oil giant announced that 30,000 of its workstations had been infected by a virus. Moreover, on August 27, Qatar's natural gas pumper, RasGas, was hit by a similar attack, resulting in the company being taken offline for a few days. A group of hackers calling themselves the Cutting Sword of Justice claimed responsibility for the attack on Saudi Aramco. They allegedly infected the organization's systems with a replicating malicious software (malware) for political reasons. Some IT analysts credit a virus called Shamoon for both attacks. Both Saudi Aramco and RasGas managed to limit the damage, as the attacks did not affect extraction or processing, but such a

bold attack had important repercussions on the IT strategies of oil and gas organizations operating in the Middle East, demanding new projects on risk assessments, new IT security policies, and the adoption of additional security solutions [Bigliani].

Nowadays energy demand is very high so the need for oil and gas is at an all-time high. Global oil demand is predicted to increase by more than a third by 2035.With this energy demand, the oil and gas industry is being challenged to increase production efficiencies in its crude oil and natural gas resources. The ability of the industry to address a number of operational challenges will be crucial in ensuring that future demand is met with adequate supply [White Paper].

During recent years, oil and gas companies have made profound investments in their safety and environmental functions. These investments have made the companies' safety and environmental systems more advanced, and have enabled the companies to become much more ambitious in their safety goals. Indeed, it 's not unusual for oil and gas companies nowadays to have an aim to zero injuries and fatalities. For most companies, however, this goal has remained difficult to achieve. Even if fatalities only happen at a fifth or a tenth the rate of 20 years ago, they still happen [Clark, Verity, Landau].

The Russian Federation is one of the world's leaders by oil and gas reserves and production. Today, Russia produces one seventh of primary energy resources of the globe. There are 12.9% of world's explored reserves of oil and 36.4% of gas. The economy of our state greatly depends on efficiency of oil and gas producers. Oil and gas production is rather a complicated and long process from field search to raw material transportation to a processing or consumption facility. At any stage, the entire complex of specialized equipment is used assuring volume of crude materials, people safety and environmental security [mir-forum.ru].

Russia is one of the northern countries that has intentions of working and exploiting oil and gas in the Arctic. According to the fact that the Arctic has a very unique and fragile environment it is importatnt to evaluate all the risks that might happen there.

The Arctic occupies almost 30 million km2. It includes open ocean and marginal seas totaling over 14 million km2, and a coastline length of approximately 45,390 km. The Arctic includes the territories of eight countries, five of which are considered to be

“coastal states”, namely, the Russian Federation, United States of America, Canada, Norway and Greenland (Kingdom of Denmark). Although the Exclusive Economic Zone (EEZ) of Iceland is within the Arctic, its landmass lies just to the south of the Arctic Circle. Sweden and Finland do not have coastlines within the Arctic [OGP].

There is international interest in the various governance aspects of the Arctic, and an appreciation that its peoples need to be respected and its natural resources developed with proper regard for the environmental and social settings. Each country regulates the exploration and development of its natural resources under domestic legislation, with appropriate environmental controls, and in accordance with the international treaties to which they are party [OGP].

In addition to the regulatory regimes, there are numerous voluntary measures to protect the Arctic. In particular the Arctic Council facilitates international cooperation on the Arctic environment, involving representatives of the Arctic countries, indigenous peoples and observer states and organizations.

Risk reduction is a continuous process that involves the operator, the regulatory authorities and other stakeholders. Standard and specific mitigations may be required by the regulatory authorities and should be incorporated into company operational plans (NMFS & BOEM).

On the bases of a thorough knowledge of the environment, the mitigation hierarchy is: avoid the impact if possible; minimise impacts that are unavoidable; restore when feasible; manage residual impacts, including compensation or offsets. The sharing of good practice between operators can help towards the objective of minimising risk to people, property and the environment.

1.4 The regulation of environmental quality through the environmental management system

The first step towards the regulation of environmental quality is establishing a management plan that should be prepared in order to address wildlife interactions with personnel and property. In all operations, starting with surveys and extending through decommissioning and after use, the prohibition on hunting, disturbing and feeding wildlife by company and contract employees should be strictly enforced. Controls should

apply to leisure and off-duty periods as well as working periods. The non-local company workforce should keep within the defined boundary of the site, to the agreed access routes and, when necessary, be segregated from local communities [OGP].

There are eleven principles of collaborative problem solving. Such collaboration is an inclusionary process that promotes lateral communication and shared decision-making. It helps stakeholder groups to develop policy recommendations on a variety of public issues. The eleven principles are: Purpose-Driven, Inclusive, Not Exclusive, Educational, Voluntary, Self-Designed, Flexible, Egalitarian, Respectful, Accountable, Time Limited, Achievable [gdrc.org].

Environmental Decision-Making deals with very broad and diverse values, interests, and participant goals. It deals with participant goals and with what has been learned regarding how best to manage participant involvement. It also covers the negotiation of the major issues and works on comprehensive decision-making. The various EDM activities should be effective and efficient. It provides learning and guidance for all participants to maintain good EDM process and product [gdrc.org].

The process of decision making consists of four stages: defining the problem, finding the information, processing the knowledge, and taking the decision. The important thing is that implementing the decision (actors and actions), as well as monitoring and evaluating the actions taken, are integral parts of the decision. The EDM should also be based on principles of legitimacy, equity, efficiency and effectiveness [gdrc.org].

If there are conflicts or some issues that arouse during the implementation of environmental management there is a tool called mediation. Mediation is a voluntary collaborative process where individuals who have a conflict with one another identify issues, develop options, consider alternatives, and develop a consensual agreement [gdrc.org].

Mediation is a means to resolve disputes without resorting to litigation or other adversarial modes of dealing with conflict. By seeking a "win-win" solution, acceptable to both sides, mediation promotes better understanding among disputants. It also costs less, results in more lasting agreements than litigation, and can be used for emotionally sensitive disputes where other forms of conflict resolution are inappropriate [gdrc.org].

Mediation might be more useful if it is used at the early stages of conflict because it preserves important relationships, allows for sensitive negotiations to occur in private, and allows for negotiations to be confidential [gdrc.org].

Any conflict can be resolved in nine easy steps. First of all, the conflict should be defined. Then, both persons should be focused on the problem itself but not against each other, and try to solve it in a climate of cooperation. Chances of mending increase if the strengths of the relationship, the shared concerns and needs are given more attention than the lone unshared separation. To solve a conflict one should learn to be an active listener and choose a place to resolve a conflict carefully. Large numbers of conflicts can be resolved without killing or wounding the other side, provided the strategies for peacemaking along with training the forgiveness skills and learning how to start with small but doable things [gdrc.org].

The exploration of oil and gas is followed by certain risks that can be prevented with the help of risk management that consists of risk perception, risk analysis, and risk preparedness. Traditionally, the field of risk management has three elements - identification of risks, risk assessment and implementation of solutions and plans [gdrc.org].

Risks may be divided into three tiers. In the lower band, the public readily accepts risks because benefits are felt to outweigh the disadvantages. In the upper band, risks are regarded as completely unacceptable and must be reduced even at very high cost or, if not possible, the activities must cease. The intermediate region is one in which decisions on risk reduction are made by trading off associated costs and benefits [gdrc.org].

Risk determination involves the related processes of risk identification and risk estimation. Risk identification is the process of observation and recognition of new risk parameters or new relationships among existing risk parameters, or perception of a change in the magnitudes of existing risk parameters [gdrc.org].

Risk, at the general level, involves two major elements: the occurrence probability of an adverse event and the consequences of the event. Risk estimation, consequently, is an estimation process, starting from the occurrence probability and ending at the consequence values [gdrc.org].

Risk acceptance implies that a risk taker is willing to accept some risks to obtain a gain or benefit, if the risk cannot possibly be avoided or controlled. The acceptance level

is a reference level against which a risk is determined and then compared. If the determined risk level is below the acceptance level, the risk is deemed acceptable. If it is deemed unacceptable and avoidable, steps may be taken to control the risk or the activity should be ceased. The perception and the acceptance of risks vary with the nature of the risks and depend upon many underlying factors. The risk may involve a "dread" hazard or a common hazard, be encountered occupationally or non-occupationally, have immediate or delayed effects and may effect average or especially sensitive people or systems [gdrc.org].

Individuals, corporations, and governments make important decisions every day. To make the best decisions, they need to accurately weigh the relative benefits and costs of various alternatives. In general, the term "full cost accounting" refers to the process of collecting and presenting information to decision makers on the trade-offs inherent in each proposed alternative. The process can be especially important for government agencies that represent a variety of interests when deciding how to allocate public funds and/or natural resources [gdrc.org].

The fundamental economic concept in FCA is opportunity cost. This definition of cost refers to the value of opportunities that are given up when a choice is made to use a limited resource for a specific purpose. Opportunity costs are typically measured in terms of direct or indirect changes in market values, but can also be measured as changes in non-market values (i.e., not reflected in market transactions). It can also be described according to legal responsibilities assigned for paying the costs. Costs for which each resource user is legally responsible for paying are private costs. The material used in filling the wetland is a private cost because payment of a fair market price is required to use the material. Opportunity costs that are not the private responsibility of the resource user are deemed external costs or (negative) externalities [gdrc.org].

The political and institutional context in which environmental decisions will be made in the new millennium is the product of two deep-seated transformations. The first is a continuing shift away from a process of policy-making dominated by state action at the global and national level, to a more complex, multi-level system of environmental governance. This links global processes, through activities at the regional and the local, to the individual consumer or citizen via a series of interconnections. The term 'governance' captures the transition to a more poly-centric mode of environmental decision-making

and refers to the emergence of new styles of governing in which the boundaries between public and private sector, national and international are more blurred [gdrc.org].

The second change is the slow but steady extension of environmental imperatives into previously 'non' environmental sectors such as agriculture, trade and energy production. The challenge for policy-makers at all levels of governance is to find the means of securing environmental policy integration, rather than treating the 'environment' as a discrete, self-standing area of decision-making one step removed from the driving forces of environmental change [gdrc.org].

Decision tools are needed to support and inform environmental decisions made at each of the different levels and in the various sectors to ensure the overall mix is consistent and supportive of sustainability. One of the key research challenges is to identify opportunities for scaling up or scaling down the experience of successfully applying tools at particular levels. There is an equally urgent need for tools that promote coordinated decision-making across sectors and levels of governance in pursuit of sustainable development [Staib].

Environmental management decisions are used to raise the preparedness for emergency situations in the oil and gas industry. Contingency planning should facilitate rapid mobilization and effective use of manpower and equipment necessary to carry out and support emergency response operations. Where appropriate, operators may find it effective to integrate their contingency arrangements using mutual aid agreements [Staib].

Approaches to strategic management and methodologies used by organizations are numerous and vary considerably with many organizations now integrating their environmental management processes into normal business processes. This integration should start at the strategic level. This can be done progressively (an incremental approach) or in a bolder way by placing environment at the centre of strategic planning and management (transformational approach) (Dunphy et al, 2003). The strategic paradigm of sustainable development that supports the transformational approach is becoming a rallying point for business organizations but the theory appears to be ahead of practice at the moment.

1.5 Environmental policy

An environmental policy is a set of fundamental principles and objectives which helps an organisation to put its environmental commitment into practice. It is the foundation upon which improvement of environmental performance and an EMS can be built. The environmental policy is the basis for any organisation's EMS. It is the policy that establishes the objectives against which an EMS will be judged. It sets both long term and short term strategies, it defines the direction in which the EMS is supposed to go.

The policy should create a vision for everybody working in the organisation. Since the policy can greatly influence an organisation's public image, it should be clear, understandable and verifiable. Many organisations already have some type of environmental policy, even if it is not written down. This could be, for instance, that an organisation has committed itself to complying with environmental legislation or to avoid major environmental impacts. Documenting these written or unwritten commitments may be a first step in developing an environmental policy.

The policy should relate to products and services, as well as supporting activities. The results of a preliminary review and the analysis of the environmental aspects of products, services and activities need to be considered before finalizing the policy. This may give insights on how the organisation interacts with the environment and how well environmental challenges are being met. For example, information obtained during the preliminary review might help define specific policy commitments.

The environmental policy needs to be explicit enough to be audited. This means that it cannot be too general. Measurable goals and commitments need to be set. Commitments made in the policy must be realistic, and how these commitments will be met needs to be planned.

Environmental Law is a mixture of state, federal, and international treaty law that concerns about the environment and protecting natural resources. It also can be described as the network of treaties, statutes, regulations, and common and customary laws addressing the effects of human activity on the natural environment. Environmental laws often relate to such issues as pollution of soil, air, or water; global warming; and depletion of oil, coal, and clean water [hg.org].

Environmental law is divided into two categories: pollution control and remediation on the one hand, and conservation of natural resources on the other. The source of authority for these laws derives from many sources, and is heavily influenced by international treaties. Many of these treaties make impact on reducing greenhouse gas emissions, prohibiting the hunting or fishing of endangered species, or even banning the testing of environmentally destructive weapons, such as atomic bombs [hg.org].

As a rule, violations of environmental laws are handled in a civil manner, with the imposition of fines or civil damages to injured parties. Although an emerging trend is spreading through the field of environmental law in favor of the passage of state laws criminalizing environmentally destructive behavior. This measure leads to prison time for those who violate property use laws in protected areas (such as building a home on protected wetlands) and business executives who allow their companies to pollute [hg.org].

Environmental laws are also relevant to product design in the form of emissions control, environmentally friendly materials, and energy-efficient electronic devices. They relate with tax laws in the form of incentives for activities intended to benefit the environment, like fuel efficient vehicles and the installation of solar panels. They also affect housing codes in the form of requirements for insulation, heat transfer through windows, and non-polluting construction materials. Frankly, environmental laws are all around us and affect nearly every aspect of our daily lives in many different ways [hg.org].

The broad category of "environmental law" may be broken down into a number of more specific regulatory subjects. While there is no single agreed-upon taxonomy, the core environmental law regimes address environmental pollution. A related but distinct set of regulatory regimes, now strongly influenced by environmental legal principles, focus on the management of specific natural resources, such as forests, minerals, or fisheries. Other areas, such as environmental impact assessment, may not fit neatly into either category, but are nonetheless important components of environmental law [Meenakshi Saxena, p. 4].

1.6 Environmental impact assessment

The term environmental assessment (EA) is used for the assessment of the environmental consequences (positive and negative) of a plan, policy, program, or project prior to the decision to move forward with the proposed action. In this context, the term 'environmental impact assessment' (EIA) is usually used when applied to particular projects and the term 'strategic environmental assessment' applies to policies, plans and programmes. Environmental assessments may be governed by rules of administrative procedure in regard to public participation and documentation of decision making, and may be subject to judicial review [foe.co.uk].

The main purpose of the assessment is to make sure that decision makers consider the environmental impacts when deciding whether or not to proceed with a project. The International Association for Impact Assessment (IAIA) describes an environmental impact assessment as "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made." EIAs are unique by the fact that they do not require adherence to a predetermined environmental outcome, but rather they require decision makers to account for environmental values in their decisions and to justify those decisions in light of detailed environmental studies and public comments on the potential environmental wallop [foe.co.uk].

Engineering and consulting companies work hand in hand as contractors for mining, energy, oil and gas companies executing EIAs. Companies operating globally such as Royal Haskoning DHV, Golder Associates, Amec Foster Wheeler, Schlumberger Water Services are an example of a much bigger pool of expertise globally. These contractors are the ones not only in charge of preparing an EIA study but most importantly getting these studies approved by each country government offices prior to the execution of a project. Each country will also have its own local contractors offering the same kind of service hence breaking out monopolies by increasing the supply of EIAs execution consultants [foe.co.uk].

Environmental threats do not have national borders. International pollution can have detrimental effects on the atmosphere, oceans, rivers, aquifers, farmland, the weather and biodiversity all over the world. Global climate change is transnational. Specific pollution threats include acid rain, radioactive contamination, debris in outer space, stratospheric ozone depletion and toxic oil spills. The Chernobyl disaster,

precipitated by a nuclear accident on April 26, 1986, is an obvious reminder of the devastating effects of transboundary nuclear pollution [Sands P., 1989, p. 402].

Environmental protection is inherently a cross-border issue and has led to the creation of transnational regulation via multilateral and bilateral treaties. The United Nations Conference on the Human Environment (UNCHE or Stockholm Conference) held in Stockholm in 1972 and the United Nations Conference on the Environment and Development (UNCED or Rio Summit, Rio Conference, or Earth Summit) held in Rio de Janeiro in 1992 were key in the creation of about 1,000 international instruments that include at least some provisions related to the environment and its protection [Weiss E., p. 32].

The United Nations Economic Commission for Europe's Convention on Environmental Impact Assessment in a Transboundary Context was negotiated to provide an international legal framework for transboundary EIA [Weiss E., p. 32].

However, as there is no universal legislature or administration with a comprehensive mandate, most international treaties exist parallel to one another and are further developed without the benefit of consideration being given to potential conflicts with other agreements. There is also a problem of international enforcement. This has led to duplications and failures, in part due to an inability to enforce agreements. An example is the failure of many international fisheries regimes to restrict harvesting practices [unece.org].

1.7 Equipment optimization as a part of environmental management

Modern oil and gas production equipment is a complex of units comprising: pump, well and control head equipment; automated plants for collection and measurement of production performance; equipment for offshore oil and gas producing platforms; crude hydrocarbons rectification, refining and processing units; and great number of other oil and gas processing equipment [mir-forum.ru].

Year by year more requirements are imposed to equipment used, so Russian scientists and designers develop more advanced models for oil and gas industry. Improvements are generally made in regards to energy consumption and furthering environmental safety [mir-forum.ru].

Equipment used at oil and gas fields can be classified as follows: equipment used for various field operations; well development equipment; reservoir gas and oil hoisting equipment; equipment to effect a reservoir; well repair equipment; equipment for oil and gas gathering and preparation for transportation [mir-forum.ru].

At each field development stage, special equipment is used. In the course of exploration drilling, autonomous boring machines are used designed with considering main requirement of minimum energy consumption along with keeping operating features [mir-forum.ru].

Production drilling means availability of equipped area and power supply. That is why drilling equipment is designed with account for external power sources. Another important feature of these operations is opportunity to drill directional wells. So, several wells from one platform can be drilled thus increasing its productive capacity.

Profitability can be raised by proper selection of pumps, since their wearing qualities and efficiency directly affect the total income of a company [mir-forum.ru].

Also is necessary a service equipment complex used for service engineering of all equipment of the platform, appraisal depreciation of all units and components and carrying out of running repair [mir-forum.ru].

The priority task of Russian oil companies consists in purchase of up-to-date equipment and adoption of new technologies. Use of obsolete equipment is not profitable and can be dangerous. Due to new technologies, well efficiency can be raised significantly and oil and gas output can be increases [mir-forum.ru].

In 2014 the United States was the fourth largest source for Russian imports of oil and gas equipment, holding an 8 percent market share. The largest Russian sources for oil and gas equipment were based in China, Germany and Italy with 17, 16, and 11 percent respectively [2016 ITA Upstream Oil and Gas Equipment Top Markets Report].

More than half of Russia's oil and gas equipment imports are represented by machinery and mechanical appliances, filter/purify machines for gases and tankers for the transportation of goods [2016 ITA Upstream Oil and Gas Equipment Top Markets Report].

The slowed economic growth is based on declining oil prices, coupled with a lack of economic reforms and various economic sanctions that put pressure on Russia's currency and bankung sector as well as reduce access to foreign financing and new

technologies. Due to these reasons Russian national oil companies revised their investment plans and become less likely to support the development of technical challenging and uneconomic deposits (i.e. improvement of oil and gas equipment). In order to meet production targets Russian oil and gas companies have doubled efforts tp maximize conventional deposits, including stimulation and drilling in existing brownfields, and some grrenfield development instead of developing oil and gas deepwater, Arctic offshore and shale [2016 ITA Upstream Oil and Gas Equipment Top Markets Report].

In the context of this policy and due to thew current stagnation of the Russian economy, U.S. componies' participation in Russian's oil and gas sector will be limited. The current economic sanctions will probably cause U.S. companies to encounter more competition in Russia's oil and gas industry because the Russian government is encouraging greater import substitution. There has been growing sentiment in Russia for more domestically sourced technology and services since sanctions were introduced, and not only in the sub sectors which were specifically sanctioned (deepwater, Arctic offshore and shale) but also the other types of equipment and technology that is used in conventional oil and gas exploration and production. The main technologies for import substitution in 2016 include horizontal drilling, well completion and stimulation, and technology to facilitate the low ering of equipment into the wellbore [2016 ITA Upstream Oil and Gas Equipment Top Markets Report].

The equipment update is importatnt for oil and gas companies because it cuts production costs and improve productivity. Industries that use advanced techniques, such as optimized inventory management, collaborative supplier relationship management and so on have more advantages comparing to the companies that do not invest into their equipment improvement. Even though the economic situation is not so productive for oil and gas companies right now the continuous equipment improvement will lead to the better enviromental situation, time saving on different operations and reduction of ecological risks in the oil and gas industry. Thus, the ecological improvement may eventually reduce the risk of non-compliance and improve health and safety practices for employees and the public.

Nowadays energy demand is very high so the need for oil and gas is at an all-time high. Global oil demand is predicted to increase by more than a third by 2035.With this

energy demand, the oil and gas industry is being challenged to increase production efficiencies in its crude oil and natural gas resources. The ability of the industry to address a number of operational challenges will be crucial in ensuring that future demand is met with adequate supply [Clark].

During recent years, oil and gas companies have made profound investments in their safety and environmental functions. These investments have made the companies' safety and environmental systems more advanced, and have enabled the companies to become much more ambitious in their safety goals. Indeed, it 's not unusual for oil and gas companies nowadays to have an aim to zero injuries and fatalities. For most companies, however, this goal has remained difficult to achieve. Even if fatalities only happen at a fifth or a tenth the rate of 20 years ago, they still happen [Clark].

The Russian Federation is one of the world's leaders by oil and gas reserves and production. Today, Russia produces one seventh of primary energy resources of the globe. There are 12.9% of world's explored reserves of oil and 36.4% of gas. The economy of our state greatly depends on efficiency of oil and gas producers. Oil and gas production is rather a complicated and long process from field search to raw material transportation to a processing or consumption facility. At anystage, the entire complex of specialized equipment is used assuring volume of crude materials, people safety and environmental security [Clark].

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Conclusion on the first chapter

Environmental management is management of organisation's activities that have or may have an impact on the environment. It is a continuous cycle of planning,

implementing, reviewing and improving the process and actions that an organisation undertakes to meet its environmental targets and requirements. Environmental management system (EMS) is also a system that complies with the requirements of international standards such as ISO 14001 and EMAS which is the part of the overall management system that includes organisational structures, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, reviewing and maintaining the environmental policy.

Both the ISO 14001 standard and EMAS only specify the structure of an EMS. The content is up to the organisation itself. The organisation decides what it wants to do, and the EMS organises the proces. If the organisation focuses the EMS on specific operational practices then operating costs can be reduced and environmental risks minimized. The objectives for improvement are set by the organisation itself.

The profit that arises from establishing of EMS is impressive. An EMS takes a systematic approach to environmental management and a systematic approach is a cost-effective approach. The environmental review highlights all the areas of the firm where improvement in performance is needed. With this information, a firm can assess which improvements will produce the greatest benefits in terms of cost savings and reduction of risk, and deal with these areas first. The firm can then set targets that benefit both itself and the environment.

The most common standardised EMS is ISO 14001, an international environmental management standard which was first published in 1996. In fact, ISO 14001 has now become so commonly accepted that it has superseded or been merged into several previous standards (e.g. British Standard 7750). Other more encompassing environmental standards have incorporated ISO 14001 as a key element. One example of the latter is the Eco-Management and Audit Scheme (EMAS), the EU supported management system and certification scheme, which goes beyond the scope of ISO 14001 in that it establishes minimum standards for auditing and the elaboration of environmental reports (the two standards also differ with respect to the requirements to environmental audits).

Environmental management in Russia faces severe problems, both from Soviet-era and continuing environmental degradation and due to the weakness of current institutions with responsibilities for environmental protection.

There is always a variety of potential risks and negative impact on the environment because of oil and gas exploration. Consequences depend upon the stage of the process, the size and complexity of the project, the nature and sensitivity of the surrounding environment and the effectiveness of planning, pollution prevention, mitigation and control techniques.

Development of oil and gas in the Arctic faces many social and environmental challenges. The pace and location of future development will be determined by a number of factors including acceptability to society, a continuing demand for hydrocarbons, viable economics, favourable regulatory regimes, technology development and the safety and wellbeing of employees and communities. Operators will continue to be responsible to the wider society for demonstrating that risks are recognised and managed.

The upstream oil and gas industry manages a wide range of risks, including political, societal, asset integrity, commercial, reputation, safety and environment. Risk management for Arctic conditions has to follow a structured approach to: identify hazards and effects that may arise from routine, emergency and past activities; assess significance, taking into account probability and consequences; document each risk (eg in a risk register) with applicable legal and other standards; establish realistic and achievable objectives and performance criteria; define risk reduction measures that are suited to Arctic conditions.

The environmental policy should create a vision for everybody working in the organisation. The environmental policy is the basis for any organisation's EMS. It is the policy that establishes the objectives against which an EMS will be judged. It sets both long term and short term strategies, it defines the direction in which the EMS is supposed to go.

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eventually reduce the risk of non-compliance and improve health and safety practices for employees and the public.

Information technology can help mitigate operational risks. Organizations that understand their risk profile and take concrete action to mitigate risks will be better positioned to be successful in the marketplace. IDC Energy Insights recommends the following to oil and gas companies:

- Consider developing a corporatewide approach to managing information in the plant. Best practices cover use of technology to support operations, business analytics, application integration, EHS compliance, and enterprise content management.

- Work to develop business processes for operations and identify document control workflow for approvals within the organization, including the transmittal and standard operating procedure (SOP) processes. Determine how often you wish to share documents with vendors, partners, regulators, and others. Work together to develop a coding standard for components/documents to ensure that there is consistent master data management.

- Participate in industry associations and user communities to help arrive at standards for sharing of content and supporting well and plant workflows.

- Look to areas of high vulnerability in your operation such as current processes that still rely on paper files that can potentially be difficult to find and update and may be misfiled or lost and ultimately expose your company to regulatory or internal audit failures.

- Focus on process improvements that will allow more effective creation and sharing of content both inside and outside the firewall. A good area to start would be the transmittal and SOP processes.

- In this time of increased regulatory pressure, look at solutions that optimize the way you manage, share, store, and archive content to comply with environmental, health, and safety regulations.

- Look at deploying information rights management tightly integrated with content management to ensure that only authorized recipients can view, copy, print, or edit confidential information.

- Reassess your customer communications capabilities to ensure timely and personalized correspondence tailored to the delivery requirements of the recipient, including customers and regulatory agencies.

- Take a more holistic approach of your asset information to ensure that drawings, records and other documentation are properly identified, stored, classified, accessible, accurate, and appropriately safeguarded.

- Familiarize yourself with emerging asset management standards such as PAS 55 and ensure that future asset management solutions that are deployed in your company operations adhere to such standards.

- Evaluate solution vendors that have the flexibility to support mobile access of project and plant information, which enables and optimizes access of information wherever it is accessed.

- Consider solutions that provide options to deploy cloud-based solutions and can support projects that require cloud deployments.

II. IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT IN THE OIL AND GAS INDUSTRY

2.1 Environmental management of investment projects in the oil and gas industry

In order to define a particular way to implement environmental management of investment projects in the oil and gas industry we are going to analyze and summarize the experience of the development of environmental management systems and social aspects of investment projects on the example of a compressor station (CS) "Port" North European Gas Pipeline (the customer - JSC "Gazprom Invest West", a project invested a group of banks and credit agencies - BNP Paribas , ECGD, SACE) and the main gas pipeline Sakhalin - Khabarovsk - Vladivostok (the customer - JSC "Gazprom invest Vostok", a project invested by JSC "Gazprom").

Gazprom didn't have its own environmental management system at the very beginning of the gas pipeline building. Its development and implementation became a condition of project financing and the priority of creditors' claims - a group of foreign banks and credit agencies (BNP Paribas, ECGD, SACE), and their environmental consultant - D'Appolonia Italian company. The originally developed environmental and social aspects management was integrated and project oriented. It included environmental aspects of the activities of both investors and building contractors, and it was also based on the standards of the International Finance Corporation [SJC Gazprom].

Construction of the integrated management mechanism at (CS) "Port" is based on two types of complementary actions: 1) distribution of responsibilities within and between levels, and 2) the integration of activities and information flows through the interaction between the levels. These two types of activities: distribution and integration, that are carried out through environmental management procedures [SJC Gazprom].

The most important component of the functioning of the integrated management system is the interaction with stakeholders. Dialogue with stakeholders is a tool to identify and assess the importance of social influences and impacts of the project, as well

as a tool for identifying unpredictable reactions to the activities carried out and its impact on the project. Without maintaining this dialogue can not be achieved in the full social impact of the investment, since this is where the most effective development of solutions to prevent and / or mitigate negative effects and the implementation of the possible positive effects [SJC Gazprom].

As an outcome when we consider the experience of functioning environmental and social aspects management of investment project it should be noted that multi-level governance system of significant environmental and social aspects of the scale, structure, resource maintenance of an appropriate set of obligations on the project in the environmental and social fields. According to this approach EMS oriented company achieves the result and move on to greater efficiency due to structural and functional restructuring of the organization. Moreover, restructuring project created at the early stages of the project cycle allows you to find the optimal solution and the allocation of resources for the functioning of EMS [SJC Gazprom].

The situation with the trunk pipeline Sakhalin-Khabarovsk-Vladivostok was initially fundamentally different. There environmental and social aspects management developed within the framework of the planned training of LLC "Gazprom Invest Vostok" for certification according to standard ISO 14001. At the stage of identifying significant environmental aspects, when the construction works were in full swing, certain problems were identified: a lack of methodological basis for assessing the significance of the specific impact on the environment in the preparation and conduct of construction; the absence of a mechanism of interaction with contractors in the field of environmental protection, particularly the absence of the conditions of such cooperation in the contractual documentation, that led to the separation between the establishment of environmental objectives and ways to achieve them; finally, the lack of direct communication between stakeholders [2].

Construction of the environmental aspects of the control system in this case was based on two key resources: 1) development of a set of normative documents, supplementing the provisions of GOST R ISO 14000 - 2007 and fills a gap in standardized requirements; and 2) the integration of EMS with the procedures of the quality management system processes, which are determined by the target setting and ways to achieve business process of "Gazprom Invest Vostok" (in particular for the

business processes for the design organization, design, and obtaining permits, conclusion construction contracts and service delivery, management of construction and installation, commissioning works) [GOST R ISO 14001].

The construction of the ecological and social aspects of management systems or environmental management systems (EMS) based on the requirements of the standards series GOST R ISO 14000 (ISO 14000) requires development of significant additions in content procedures and regulatory provision, and the mechanisms of their implementation, also considering the specification of the investment project at all its stages [GOST R ISO 14001].

The management of the ecological component of investment projects is based on methodological approach in which evaluation of the significance of environmental and social impacts of the project at its various stages is associated with the construction, implementation and improvement of EMS. Evaluation of EMS is based on criteria such as the ability to take into account the specifics of the current project and to achieve significant environmental and social effects [Romanov].

The functioning of the EMS as a dynamic system is especially important in the implementation of investment projects in the oil and gas industry because it is connected with high-risk and environmental hazards, affecting virtually all components of the environment. The great length and scale of production facilities, such as pipelines, involve a wide range of groups and organizations whose interests are affected by start-up and implementation of the investment cycle. The stage of construction makes different social and environmental impacts, as it includes a primary, destructive implementation of foreign technical systems in natural systems and well-established way of local people. This process brings a transition to the new man-made landscapes, and adaptation of the population to the new conditions. Design and creation EMS can prevent, reduce or minimize such effects at the preparation phase of the project [Romanov].

As we can see at the Table 1 international EMS standards cover all stages of the investment cycle, and at the same time carry out the vertical integration of requirements, including the level of investment policies, regulatory requirements to ensure the management systems, requirements for operational and control management procedures and their correction. In Russia the investment activity is one of the types of economic activity that is not supported by environmental legislation standardized requirements that

take into account the specification of the preparation and implementation of investment projects, making it difficult to follow the provisions of the law [Romanov].

EMS standards for different levels of investment management at various stages of the investment cycle (Table 1):

Table 1

<table>
<tr><td rowspan="2">Operation level</td><td colspan="3">Stage</td></tr>
<tr><td>Pre-investment (investment rationale, building project)</td><td>Investment (design engineering, logistical support, building)</td><td>Operational (production and provision services)</td></tr>
<tr><td rowspan="2">International</td><td colspan="3">Examples: Policy and Standards of social and economic sustainability of International financial corporation; Ecological and social policy and Standards of project realization of the European bank of reconstriction and development; Ecolofical aspects of the investment policy of the Euroasian bank of development.</td></tr>
<tr><td></td><td>ISO 14000 not adapted to the specification of the investment project</td><td>ISO 14000</td></tr>
<tr><td rowspan="2">National</td><td rowspan="2">-</td><td>No standards for the stage of design engineering and environmental impact assessment</td><td rowspan="2">Example: ISO 14001 - 2007</td></tr>
<tr><td>ISO 14000 doesn't consider the specification of the investment project</td></tr>
<tr><td rowspan="2">Corporational (Gazprom)</td><td rowspan="2">-</td><td>No standards for the stage of design engineering and environmental impact assessment</td><td rowspan="2">EMS system of Gazprom: "The environmental impact assessment in the system of ecological management", "Planning for the Environmental safety", "The process of identification of environmental aspects in the environmental management system"</td></tr>
<tr><td>JSC Gazprom EMS standards can't be applied to the design stages and the environmental impact assessment, they are not adapted to the peculiarities of the building stage.</td></tr>
</table>

Separation of the state investment policy from the environmental requirements is transmitted to the level of corporate investment management. The absence of integrative interactions between investment and environmental policies of Gazprom, the absence of the guidelines for environmental results create difficulty in determining the development of the environmental management in the oil and gas investment projects. Corporate standards and other regulatory documents on EMS, such as "the environmental management system of Gazprom", Recommendations on "Planning for the Environmental safety" of Gazprom, "The process of identification of environmental aspects in the environmental management system" of Gazprom, developed in accordance with GOST R ISO 14001-2007 (ISO 14001), defines the scope of EMS objects of gas industry during the operational phase, while EMS is characterized by a rigid structure, staffing constraints, excluding the possibility of changing this structure [Guidance on ecological management of Gazprom].

Focus on operational phase causes gaps in the corporate normative provision of environmental management at the stages of project preparation and construction phase [Guidance on ecological management of Gazprom].

Based on the information mentioned above we can outline several recommendations on the creation and implementation of environmental and social aspects management and EMS in the oil and gas investment projects. Firstly, you need a standardized procedure for determining the areas of responsibility of the customer and contractors to ensure the environmental safety of oil and gas investment projects that would regulate the responsibilities of organizing EMS level of investment contracts and tender documents [Environmental and social procedures].

Secondly, you need a single methodological approach to the identification of environmental aspects of the project that will be used during the environmental impact assessment (EIA) on the construction and operational phases, and in the process of EMS at these stages. Project decisions developed on the basis of design solutions in the field of environmental protection do not match the list of significant environmental aspects. Thus, the EMS requirements of the investment project can not be fully achieved [MFK].

Thirdly, organizational interaction between customer and contractors during the construction phase is fundamentally different from the operational phase, when

constantly functioning operating organization works with the same initial list of environmental aspects and has the ability improve the EMS tools and reach significant results in improving the environment. During the construction phase there is an active development of new territories and the corresponding change of the importance of environmental and social aspects, the dynamic EMS is absol necessary, because its essential element is the interaction between contractors and stakeholders [MFK].

Fourthly, it is necessary to establish requirements for corporate monitoring and control functions from the customer that acquire a different structure and the importance of the implementation of investment projects. Industrial environmental control and monitoring are followed by monitoring the compliance of the requirements of contractors; it is also necessary to monitor the implementation of the requirements for stakeholder engagement [Environmental and social procedures].

According to the information above we can give certain recommendations for the development and implementation of EMS in the investment projects. The most effective project-oriented EMS systems are systems that provide vertical and horizontal integration of environmental activities of all entities involved in the project - investors, designers, building contractors, suppliers of material and technical resources.

Identification and detailed analysis of the significant environmental aspects of the project, as well as the main features of EMS, should be developed by general designer within the framework and development of environmental measures. In the future, the list of significant environmental aspects and actual procedures investor will be able to adapt to the particular situation.

Basic principles of EMS and requirements for environmental activities should be a part of the contractual documentation of all levels: the investment agreement, the contract with the general designer, contracts with building contractors and suppliers. Agreement (for example, "Requirements for Contractors") must contain the rights and obligations of each subject, performance criteria, mechanisms for monitoring, reporting standards, administrative and financial control mechanisms.

All interested parties and stakeholders, including the public, business entities in the project's area of influence, the supervisory authorities should be involved into the environmental management.

The environmental and social aspects of the project should be managed together on the common principles.

The best way to the efficient functioning of the environmental management of investment projects can be defined as the management of environmental aspects, carried out at all stages of the project with the help of the environmental and social assessment through mechanisms of interaction with contractors and stakeholders. An important condition of the organization of effective interaction is the regulatory and legal support at corporate and institutional levels.

2.2 Environmental responsibility of the Russian oil and gas companies

Oil and gas are among the world's most important resources.The oil and gas industry plays a critical role in driving the global economy, and the activities of oil and gas companies have manynegative impacts on the environment, which are becoming increasingly significant due to the increased use and transport of oil andgas. Many environmental disasters associated with the activitiesof oil and gas companies also have material effects on the compa-nies' financial reports (The International Federation of Accountants,2010).

For example, a catastrophic oil spill in 2010, caused by anexplosion at a British Petroleum (BP) drilling rig in the Gulf of Mexico, inflicted majordamage to the ecosystem and had major financial implications for BP. The Exxon Valdez oil tanker that ran aground in Alaska's PrinceWilliam Sound in 1989 caused a major environmental disaster withdire financial consequences. Due to the potential for environmentaldegradation, many stakeholders have started to pay close attentionto the environmental implications of the activities of oil and gascompanies. Many international organizations, governments, andlobby groups have cautioned companies to be more environmentally responsible, and to consider their impact on society and the environment [Alazzani].

Nowadays there is a rating of Environmental Responsibility of Oil and Gas companies in Russia that was first held in 2014, in 2015, and 2016. It was conducted by the cooperative initiative by CREON Group and WWF Russia with participation of National Rating Agency. The pilot rating goal was to provide an unbiased and

comparable data on environmental responsibility of participants and the impact of Russian oil and gas industry players on the environment. It is believed that public should have more excess to such information that will influence the reputation of hydrocarbon producing and processing companies, and, ultimately, promote environmental risks management quality resulting in decreased environmental impact [Chetverikov, p. 2].

This rating has been recognised by organizers and representatives of oil and gas sector so these companies are willingly providing information concerning environmental impact. Is shows that the rating is becoming a useful tool that stimulates entrepreneurs to become more transparent in environmental policy matters. The founders of this rating believe that increased competition in the field of environmental protection will potentially lead to long-term and cheaper financial resources for the most transparent companies [Chetverikov, p. 3].

This project has shown that is it a useful tool of influence on oil and gas industry decision-making processes when it comes to environmental protection. More companies are willing to show their data and this data becomes more detailed. The rating is some kind of a bringe that connects industy and society in terms of environmental protection [Chetverikov, p. 3].

The targets of this rating are:

1. To identify key indicators of impact on environment from oil & gas companies activities in Russia. The Rating makes it possible to create an immersive quantified database to be used for calculation of industry average indicators related to discharges, emissions, and wastes.

2. To compare main oil and gas companies by the following criteria:

• the company’s level of environmental impact per production unit

• the extent of transparency and availability of ecologically significant information • the quality of eco-management in the company (compliance of activities with corporate and national environmental policies, best standards and practices)

• the frequency of violating environmental legislation in project execution areas by the company

• the efficiency of mineral resources extraction.

3. To make record of the year-over-year changes in the above-listed indicators [Chetverikov, p. 6].

Our study is based on the Environmental responsibility rating of the Russian oil and gas companies is held by CREON group of companies, WWF Russia, Natianal rating agency (NRA), Ministry of natural resources and environment of the Russian Federation, etc. Two years have passed after the first rating had been published and today it is stated that the project has been a success. The rating is recognized in the industry, which was proven with the meeting of the rating organizers and representatives of Oil & Gas sector that took place on July 5, 2016. The event, dedicated to the rating methodology adjustments, gathered employees of 10 companies who introduced over 50 different initiatives and suggestions [Kilzie].

In 2016 the rating methodology has undergone through certain adjustments. In particular, the criterion that stimulates companies to establish and develop programs for biodiversity preservation in the areas of operation will now be accounted for in the final rating results, whereas previously it was applied in the test status only. Furthermore, the criterion covering greenhouse emissions dynamics has become quantifiable value and, thus, has been transferred from Environmental Management to Environmental Impact. In addition, the criterion that evaluates the level of public disclosure of incidents with considerable social and environmental impact and of pending environmental conflicts has been expanded — from now on the rating also takes into account whether rated companies undertake corresponding recovery and conflict mitigation measures.

A new framework criterion was also introduced — indicator of whether “green office” principles are incorporated in environmental policies of rated companies.The elevated rating recognition and efficiency is further supported with improved public availability of information on rated companies. During the first year only 3-4 companies publicly disclosed corresponding reports with respect to the range of quantitative rating indicators, yet today over ten of rating participants share this information. New quantifiable values improve calculations reliability of industry averages that represent overall environmental impact of Oil & Gas segment. The goal of each responsible company is to further improve average industry values [Kilzie].

The most visible trend of the rating held in 2016 comparing to 2015 is the growth of environmental responsibility and trasparency for most companies. The three rating leaders are Sakhalin Energy, Gazprom, and Surgutneftegaz. Sakhalin Energy has improved its position from 2014 and 2015 and now is the leader of the final rating, while

Gazprom and Surgutneftegaz lost one position each. The best rating dynamics were shown by Exxon NL, Total PPP, LUKOIL, and Zarubezhneft. Also, LUKOIL, and Zarubezhneft made public a large volume of information in the Internet sites and their subsidiaries [Chetverikov, p.22].

Thus, we can see that the rating of oil and das enterprises has positive effects in the sphere of environmental improvements and public acknowledgement (Table 2).

Table 2

Final position	Company	Environmental impact rating point	Environmental management	Disclosure/ Transparancy	Rating 2015 final position	Final rating point
1	Sakhalin Energy (Sakhalin-2)	1,8	2	1,7778	3	1,8593
2	Gazprom	1,6364	1,8571	1,6667	2	1,7201
3	Surgutneftegaz	1,6364	1,8571	1,5556	1	1,6830
4	LUKOIL	1,5455	1,8571	1,5556	5	1,6527
5	Salym Petroleum Development	1,5	1,8571	1,5556	7	1,6376
6	Exxon Neftegaz Limited (Sakhalin-1)	1,7	1,8571	1,3333	9	1,6302
7	NOVATEK	1,6	1,2857	1,3333	12	1,4063
8	Gazprom Neft	1,0909	1,7143	1,3333	10	1,3795
9	Rosneft	1,2727	1,5714	1,2222	6	1,3555
10	Zarubezhneft	1,1	1,2857	1,3333	4	1,2397
11	Irkutsk oil company (INK)	1,3	1,1429	1,2222	14	1,2217
12	Total PPP	1,2	1,5714	0,7778	11	1,1831
13	Tatneft	1,2727	1	0,8889	8	1,0539
14	Bashneft	0,4545	0,8571	1,1111	13	0,8076
15	Transneft	0,9	0,5714	0,4444	15	0,6386
16	Tomskneft VNK	0,1818	0,5714	0,6667	16	0,4733
17	Slavneft	0,1818	0,4286	0,7778	17	0,4627
18	NNK/Alliance	0,1818	0,1429	0,5556	18	0,2934
19	Russneft	0	0,1429	0,5556	19	0,2328
20-21	Neftisa/Belkamneft	0	0	0,4444	20	0,1481
20-21	Arcticgas	0	0	0,4444	21	0,1481

According to the rating of Environmental Responsibility of Oil and Gas companies in Russia that was held in 2015 by by CREON Group and WWF Russia with participation of National Rating Agency the three rating leaders are Sakhalin Energy,

Gazprom and Surgutneftegaz in their environmantal responsibility and trasparency. As a matter of fact all these companies correspond to the environmental standard ISO 14001. Also, LUKOIL, and Zarubezhneft made public a large volume of information in the Internet sites and their subsidiaries [Kilzie].

Traditionally, the basic principle of the rating compilation is that exclusively publicly available information is used. Therefore, the focus was primarily on the completeness and quality of environmental information disclosed. Rating organizers note that the business transparency level of Russian Oil & Gas companies increases every year both with respect to the number of disclosed environmental protection aspects, and in terms of quality of the latter. The participating companies cooperate with rating organizers extensively at the rating preparation stages. Thus, in August-November 2016, 15 out of 21 rated companies accepted the rating organizers' suggestion to disclose additional information on environmental responsibility or submit corresponding comments. This year, two different levels of business transparency on the matter were singled out:

- Sufficient level of business transparency Majority of rated companies (15 of 21 participants) fall within this level. These companies publish environmental responsibility reports and disclose information on implemented environmental management system and environmental impact from their operations in the special sections of their official sites. Nine companies (Rosneft, Lukoil, Gazprom Neft, Tatneft, Bashneft, Gazprom, Sakhalin Energy, NOVATEK, and Zarubezhneft) publish non-financial reports, which comply with international GRI (Global Reporting Initiative) standards. Another six companies (Surgutneftegaz, Exxon NL, Salym Petroleum, Irkutsk NK, Transneft, and Total PP) publish environmental reports in accordance with internal corporate standards rather than following GRI requirements.

- Insufficient level of business transparency 6 of 21 rating participants that do not publish non-financial reports and only disclose very limited information on environmental aspects of their operations at their official sites fall within this level. Namely, these companies are Slavneft, Tomskneft VNK, Russneft, Alliance/NNK, Neftisa-Belkamneft, and Arcticgas [Kilzie].

The best known global voluntary international standard of non-financial reporting is Global Reporting Initiative (GRI). GRI G4 guidelines was published in

May 2013. As opposed to the previous version, this guidelines established only two levels of compliance with GRI recommendations: basic and expanded. Whereas at the moment of first rating compilation only one Russian oil & gas company published sustainable development report with account for GRI G4 requirements, by the end of 2015, however, a total of nine Russian oil & gas companies implemented GRI G4 standards. All these companies publish reports that meet basic level of compliance requirements. Expanded level reports are not yet being published by any company [Kilzie].

Fundamental improvements in Russian environmental management require fundamental reshaping of Russian institutions. This includes establishing more competitive real-market relations rather than virtual economic ones, establishing a rule of law, decreasing corruption significantly, implementing a tax code that is transparent and does not penalize environmental compliance, and attracting foreign direct investments that provide management and technological improvements rather than what is often perceived to be second-rate technology and lower levels of environmental protection. It also likely requires instilling in businesses and individuals a sense of environmentally responsible behavior. This is a difficult tightrope act when enterprises face market pressures to shed themselves of the historical social responsibilities they have had to local communities, and citizens search for meaningful ways to be civically engaged in the face of day-to-day economic pressures [Chetverikov, p. 26].

So, we can highlight several effective applications of environmental management on oil and gas enterprises:

- appropriate international and national laws, regulations and guidelines;
- coherent procedures for decisions on projects/activities;
- legislation with clearly defined responsibilities and appropriate liabilities;
- appropriate monitoring procedures and protocols;
- enforceable standards for operations;
- performance reporting;
- adequately funded and motivated enforcement authorities;
- appropriate sanctions and political will for their enforcement [UNEP, p. 28].

Oil and gas development activities are expected to grow to meet the need of rapidly industrializing countries, and can be carried out safely with minimum adverse environmental impact, only through a strong company commitment to environmental protection. The host government also needs to have a solid understanding of exploration and production operations and how they may affect the environment. The activities on

both sides should ideally be complementary to achieve the most cost-effective and environmentally sound approach. So, we can identify key points that should be considered and to my opinion are the most efficient during the process of implementation of environmental management in enterprises:

- systematical integration of environmental issues into business decisions through the use of formal management systems;
- integration of health, safety and environmental management into one program;
- taking into consideration all the areas that might be at risk (water, air, soil, etc.) before making any strategic decision;
- use waste prevention techniques, re-use waste components;
- minimize resource inputs;
- bring innovations and constant improvements into all industrial processes.

Many companies operate in widely varying climatic, geographic, social and political circumstances. Sometimes legislative frameworks and socio-economic and physical infrastructures are highly sophisticated. Companies need a consistent management approach that can be realized through the introduction of environmental management system. There are such standards as ISO 14001, OHSAS 18001 that provide system models that can be used by companies in order to improve their operating efficiency and reduce environmental impacts. On the Table 3 we can see the companies that have already introduced environmental system management and got certain certificates and others that haven't done it yet.

Table 3

Name of the company	Environmental review	Environmental policy	Environmental programme	Environmental management system	Environmental audit	Environmental statement	Verification and Registration
Surgutneftegaz	+	+	+	Environmental management structure	+	+	ISO 9001:2008, ISO 14001, OHSAS 19001, ISO/TS 29001
Sakhalin Energy (Sakhalin-2)	+	Sustainable development policy		+	+	+	ISO 14001: 2009, ISO 26000:2010
Zarubezhneft			+			+	

LUKOIL	+	+	+	+	+	+	ISO 14001: 2004, OHSAS 18001: 2007
NK Rosneft	+	+	+	+	+	+	ISO 14001: 2004, OHSAS 18001: 2007
Salym Petroleum Development		+		HSSE management system		+	ISO 14001: 2004, OHSAS 18001: 2007
Tatneft	+	Resource Saving Policy	+		+	+	
Gazprom	+	+	+	+	+	+	ISO 14001: 2004
Exxon Neftegaz Limited (Sakhalin-1)	+	+	+	+	+	+	ISO 14001: 2004, OHSAS 18001: 2007
Gazprom Neft	+	+	+	+	+	+	ISO 14001: 2015
Total PPP	No information						
NOVATEK		Health and Safety Environment Policy		Integrated Health, Safety and Environment Management System (IMS)	+	+	
Bashneft	+		+	+	+	+	ISO 14001:2004, Certificate of Registration Occunation health & safety management system
Irkutsk Oil Company (INK)	+	+	+	+	+	+	ISO 14001: 2004, OHSAS 18001: 2007
AK Transneft	+	+	+	+	+	+	ISO 14001: 2004 + Cor

							1: 2009
Tomskneft VNK	+	+	+	+	+	+	ISO 14001: 2004, OHSAS 18001: 2007
Slavneft	+		+			+	
NNK/Aliance	No information						
Russneft			Environmental improvement program at the oilfields of the Variogan region				
Neftisa/Belkamneft	+	+	+			+	
Arcticgas	No ecological information, subsidiary of Gazprom and NOVATEK						

As we can see from the Table 3 environmental review was done by 14 companies out of 21 (67%), 14 companies have environmental policies (67%), 15 companies have environmental programmes (71%), 13 companies have environmental management systems (62%), 13 companies held environmental audit (62%), 17 companies present their environmental statements (81%), and 12 companies have verification and registration (57%).

2.3 Environmental practices of oil and gas companies against the Sustainability Reporting Guidelines

The interesting question is if the use of a voluntary standard assessment system for environmental reporting could help mitigate the damage caused by oil and gas companies to developing nations.What level of data reporting by these companies is needed to allow the assessment of environmental practices? To answer these ques-tions, we evaluate the environmental practices of several oil and gas companies against the Sustainability Reporting Guidelines issued in 2006 by the Global Reporting Initiative (GRI), also known as ‘G3’ [Alazzani].

The GRI was established as a voluntary co-operative initiative in late 1997 by the Coalition for Environmentally Responsible Economies.Its aim is to provide a

standardized and generally accepted sustainability reporting framework. The first set of formal SustainabilityReporting Guidelines was published in June 2000. The GRI framework is globally recognized as the most widely used sustainability reporting tool; the performance indicators listed there in are used to measure and report an organization's economic, environmental, and social performance, in what is also known as 'triple bottom line'or 'People, Planet, Profit' reporting (GRI, 2012). So, we choose several oil and gas companies for detailed analysis [Alazzani].

We assessed to what extent the companies followed the GRI Sustainability Reporting Guide-lines. We chose the GRI indicators because they provide the most comprehensive reporting framework of principles, standard disclosures, indicators and reporting protocols, augmented by a series of sector specific supplements and resource documents. The guidelines cover three dimensions: environment, economic, and social. We focused only on the environment dimension [Alazzani].

We found that reasonable efforts were made to disclose environmental performance indicators, particularly those relating to theprotection and restoration of habitats, greenhouse gas emissions, and significant spills. However, none of the companies disclosed information on the percentage of their products that are sold, or onthe percentage of their packaging materials that are reclaimed bycategory. We conclude that the GRI Sustainability Reporting Guidelines provide a robust tool for reporting comprehensive progress concerning issues relating to environmental concerns raised by amultitude of stakeholders [Alazzani].

Companies selected for this study were chosen by the following criteria: they are within oil and gas industry; they are top Russian companies, that participated in the Environmental rating held by the CREON group; they have made a formal commitment to consider the environment. The selected companies were:

- Sakhalin Energy Investment Company Ltd. (Sakhalin Energy-2) is developing the Piltun-Astokhskoye oil field and the Lunskoye gas field off the north-eastern coast of Sakhalin. Its activities include production, transportation, processing, and marketing of oil and natural gas. The company operates under the Production Sharing Agreement (PSA) signed between Sakhalin Energy and the Russian Federation (represented by the RF Government and Sakhalin Oblast Administration) in June 1994. This Agreement was the first PSA in Russia [sakhalinenergy.ru].

The company pursues the goal of not harming people, protecting the environment and contributing to sustainable development. This attitude is beneficial to the residents of Sakhalin and other key stakeholders. The Russian Federation and Sakhalin Oblast receive numerous benefits from the Sakhalin-2 project, including billions of dollars in investments, high local employment, contracts for Russian businesses, etc [sakhalinenergy.ru].

Health, Safety, Environment (HSE) and Social Performance (SP) management is an integral part of the entire corporate management system. Sakhalin Energy is guided in its HSE and SP activities by the following fundamental policies: Sustainable Development Policy; Commitments and Policy on Health, Safety, Environment and Social Performance adopted in 2001 and updated in 2013; Health, Safety, Environment and Social Performance Management System; and HSE and Social Action Plan [sakhalinenergy.ru].

- Gazprom views its mission as ensuring a reliable, efficient and balanced supply of natural gas, other energy resources and their derivatives to consumers. Gazprom's strategic goal is to establish itself as a leader among global energy companies by diversifying sales markets, ensuring reliable supplies, improving operating efficiency and fulfilling its scientific and technical potential [gazprom.ru].

Gazprom holds the world's largest natural gas reserves. The Company's share in the global and Russian gas reserves amounts to 17 and 72 per cent respectively. Gazprom accounts for 11 and 66 per cent of the global and national gas output correspondingly. At present, the Company is actively implementing large-scale gas development projects in the Yamal Peninsula, the Arctic shelf, Eastern Siberia and the Russian Far East, as well as a number of hydrocarbon exploration and production projects abroad [gazprom.ru].

Gazprom's EMS encompasses various management levels ranging from the Company's Board of Directors to subsidiary headquarters and facilities. The EMS is deployed at 36 of Gazprom's wholly-owned subsidiaries specialized in exploration, production, transmission, storage and processing of gas and gas condensate, as well as investment activities. The economic and environmental effect of Gazprom's Comprehensive Environmental Program (2011–2015) totaled some RUB 44.6 billion [gazprom.ru].

- Oil and gas producer Surgutneftegas is one of the largest companies in the Russian oil sector. Over many years, the company has been leading the industry in terms of exploratory and development drilling, as well as the number of production wells brought on stream. The company was the first in Russia to develop the complete cycle of gas production and processing, gas-based power generation, and petrochemical feedstock. Divisions of the company are involved in the whole range of prospecting and reservoir management operations, construction of facilities, environmental safety, and process automation [surgutneftegas.ru].

Environmental management structure of OJSC “Surgutneftegas” functions as a part of integrated management system of the Company. Application of the environmental management system mechanisms provides the Company´s activity for achieving of its main goal in the field of the environment protection: systematic increase of ecological safety of the production by implementing comprehensive ecological programs [surgutneftegas.ru].

Constant monitoring of environmental performance and control of its compliance with laws and regulations and corporate standards is an integral part of the environmental management. At the same time, particular attention is paid to increasing of personnel awareness and competence level and ensuring that each employee realizes one´s role in environmental protection activity of the Company [surgutneftegas.ru].

- LUKOIL is one of the major international oil and gas companies that accounts for more than 2% of the world's oil production and around 1% of the proven hydrocarbon reserves. While having the full production cycle, the Company exercises full control over the whole production chain — from oil and gas production to petroleum product sales. The Russian Federation accounts for 88% of hydrocarbon reserves and 83% of hydrocarbon production, with the main activities concentrated in four federal districts, including the Northwestern, Volga, Urals and Southern Federal Districts [lukoil.ru].

Sustainable development objectives are integrated into the general business strategy and achieved as part of the target programs and development plans developed for specific business segments. While developing and approving plans, budgets and investment programs, the Board of Directors takes into account the objectives outlined in the Environmental Safety Program of the LUKOIL Group Organizations, as well as in the Policy and Functional Strategy for Personnel Management, and in the charity and

sponsorship programs. Achievement of strategic objectives is monitored at the strategic and operative levels [lukoil.ru].

- Salym Petroleum Development N.V. (SPD) is a Joint Venture set up in 1996 with a view to develop the Salym group of oilfields in Western Siberia. SPD shareholders on a 50:50 basis are Shell Salym Development B.V. and Gazprom Neft. SPD has come to a region which has for many years been the heartland of the Russian oil industry. Major Russian oil companies operate here. These are staffed with highly skilled oil professionals and have an abundant experience of working in tough Siberian climate conditions [salympetroleum.ru].

Environmental protection is an underlying principle in SPD's operations. Our environmental programs and projects are generated pursuant to the requirements of the Russian environmental legislation and international environmental standards [salympetroleum.ru].

SPD's success in environmental activities has been acknowledged by relevant regional state authorities as well as independent auditor companies. SPD is a winner of the regional contest 'Best Environmentally Safe Oil & Gas Producing Enterprise of Yugra' in 2014 and 2016. At the 7th All-Russia Conference 'Ecology and Production. Outlook For Development Of Economic Framework For Environmental Protection', following the results of 2012, our company was included in the list '100 Best Organizations of Russia. Ecology and Environmental Management'[salympetroleum.ru].

- The Sakhalin-1 Project, operated by Exxon Neftegas Limited, is one of the largest single international direct investments in Russia and an excellent example of how advanced technologies are being applied to meet the challenges of the world's growing energy demand. Over its years of production operations, the multi-billion dollar project has exhibited exemplary operational, environmental, and safety performance, and has provided significant benefits to Russia and its people [sakhalin-1.ru].

Exxon Neftegas Limited Environmental Protection Policy is the policy of the Sakhalin 1 Project and its operator, Exxon Neftegas Limited (ENL), to conduct its business in a manner that is compatible with the balanced environmental and economic needs of the Sakhalin 1 Project communities. ENL is taking the environmental vulnerability of Sakhalin Island into consideration and believes that Sakhalin-1 resources can be developed on the basis of principles of environmental responsibility, meaning the

prevention or mitigation of adverse impact through the use of carefully developed design solutions and measures to avoid or mitigate impact. ENL is committed to continuous efforts to improve environmental performance throughout its operations [sakhalin-1.ru].

- PAO NOVATEK is one of the largest independent natural gas producers in Russia. The Company is principally engaged in the exploration, production, processing and marketing of natural gas and liquid hydrocarbons and have 20 years of operational experience in the Russian oil and natural gas sector [novatek.ru].

NOVATEK's core producing assets are located in the Far North, a harsh Arctic region with vast mineral resources and a fragile and vulnerable eco-environment. Throughout all of its operations the Company is committed to environment protection. In 2015 environmental expenditures of NOVATEK, its subsidiaries and joint ventures aggregated RR 776 mln. NOVATEK has implemented a corporate-wide Health, Safety and Environmental ("HSE") Policy and all of the Company's principal subsidiaries and joint ventures operate an Integrated Health, Safety and Environment Management System (IMS), which comply with the international ISO 14001:2004 and OHSAS 18001:2007 standards. In 2015, NOVATEK successfully passed another IMS compliance audit [novatek.ru].

- Gazprom Neft Group consists of more than 70 production, refining and sales subsidiaries in Russia, neighbouring countries and further afield. The Company refines approximately 80% of all the oil it produces, one of the highest ratios of all Russian companies in the sector. Gazprom Neft is the third-largest oil company in Russia by refining volume and fourth largest in terms of production. Gazprom Neft operates in Russia's major oil and gas regions: in the Khanty-Mansi and Yamalo-Nenets Autonomous Districts and in the Tomsk, Omsk and Orenburg regions. The Company's major refining facilities are in the Omsk, Moscow and Yaroslavl regions, and also in Serbia. Additionally it has production projects outside Russia — in Iraq, Venezuela and other countries [gazprom-neft.ru].

The company's environmental management system, fully compliant with international ISO 14001 standards, has been in operation throughout the Gazprom Neft Group of Companies since 2014, and is reviewed annually by an independent audit organisation. The company's compliance with ISO 14001:2015 standards was again confirmed in 2016 [gazprom-neft.ru].

Published environmental information was collected from the companies' sustainability reports (SR) or corporate social responsibility (CSR) reports. The main tool used for analyzing the published data was content analysis, which is a "technique for making inferences by objectively and systematically identifying specified characteristics of messages" (Holsti, 1969).

We considered environmental practice and reporting as a single construct,in which companies perform environmental activities and disclose such activities in their social responsibility (SR/CSR) reports. We detected the presence (1) or absence (0) of certain words and concepts in texts covering environmental practices and activities in corporate disclosures within SR/CSR. The disclosure of related information was thus assumed to reflect the environmental activities adopted by thecompany. Our evaluation of the eight chosen companies' environmental reports against the GRI guidelines is summarized in Table 4. The GRI guidelines provide clear definitions for each indicator, which make it easy and accurate to assess the companies'environmental performance. Furthermore, coding was simplified because some companies provided an index that was cross-referenced withthe GRI indicators [Alazzani].

Table 4

GRI indicators	Sakhalin-2	Gazprom	Surgutneftegaz	LUKOIL	Salym Petroleum	Exxon Neftegaz	NOVATEK	Gazprom Neft
Materials used by weight or volume	0	1	0	0	0	0	0	0
Percentage of materials used that are recycled input materials	0	0	1	0	0	0	0	0
Direct energy consumption by primary energysource	1	1	1	1	1	1	0	1
Indirect consumption by primary source	1	1	0	1	1	1	0	0
Energy saved due to conservation	1	1	1	1	1	1	1	1

and efficiency improvements								
Initiatives to provide energy-efficient or renewable energy-based products and services, and reductions in energy requirements as a result of these initiatives	1	1	1	1	1	1	1	1
Initiatives to reduce indirect energy consumption and reductions achieved	1	1	0	1	1	0	0	0
Total water withdrawal by source	1	1	1	1	0	0	0	0
Water sources significantly affected by withdrawal of water	1	1	0	1	0	0	0	0
Percentage and total volume of water recycled and reused	1	0	0	1	1	0	1	0
Location and size of land owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	1	1	1	0	0	1	1	1
Description of significant impacts of activities, products,	1	1	1	1	1	1	1	1

and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas								
Habitats protected or restored	1	1	0	1	1	1	1	1
Strategies, current actions, and future plans for managing impacts on biodiversity	1	1	0	1	0	1	0	0
Number of IUCN Red List species and national conservation list species with habitats in areas affected by operations, by level of extinction risk	1	1	0	0	1	0	0	0
Total direct or indirect greenhouse gas emissions by weight	1	0	1	1	1	1	1	1
Other relevant indirect greenhouse gas emissions by weight	1	0	0	0	0	0	0	0
Initiatives to reduce greenhouse gas emissions and reductions achieved	1	1	1	1	1	1	1	1
Emissions of ozone-depleting substances by weight	1	1	0	1	1	0	0	0

Nox, Sox, and other significant air emissions by type and weight	1	1	1	1	1	1	1	1
Total water discharge by quality and destination	1	1	1	1	0	0	0	0
Total wight of waste by type and disposal method	1	1	1	0	1	1	1	1
Total number and volume of significant spills	1	1	1	1	0	1	0	0
Weight of transported, imported, exported or treated waste deemed hazardous under the terms of the Bazel Convention Annex I, II, III, VIII< and percentage of transported waste shipped internationally	1	1	1	0	1	0	0	0
Identify, size, protected status, and biodiversity value of water bodies and related habitats significantly affected by the reporting organizaton's discharges of water and runoff	1	1	0	0	1	0	0	0
Initiatives to mitigate environmental impacts of products and	1	1	1	1	0	0	1	1

services, and extent of impact mitigation								
Percentage of products sold and their packaging materials that are reclaimed by category	1	0	0	0	0	0	0	0
Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations	1	1	1	0	1	1	1	1
Significant environmental impacts of transporting products and other goods and materials used for the organization's operations, and transporting members of the workforce	1	0	1	0	0	1	0	0
Total environmental protection expenditures and investments by type	1	1	1	0	0	0	0	0
Total environmental items disclosed	28	24	18	18	17	14	12	11

In our assessment of the eight oil and gas companies' environmental reports against the GRI indicators, their reported environmental performance was scored between 11 and 28 (out of a maximum score of 30). The highest level on environmental

performance was reported by Sakhalin Energy (Sakhalin-2); the lowest by Gazprom Neft. The remaining companies scored between 12 and 24. In order to get a better understanding we looked at the environmetnal activities that were most and least commonly practiced by the companies. We found that the following three environmentally responsible practices were implemented: habitats protected and restored; monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations. By contrast we found that almost all companies disclosed information about: Percentage of products sold and their packaging materials that are reclaimed by category, possibly because this requirement is not applicable to them.

Content analysis of the environmental reports of the eight most environmentally responsible oil and gas companies we selected indicates that they made reasonable efforts to disclose their environmental performance inaccordance with the GRI Sustainability Reporting Guidelines. These guidelines appear to provide a robust and readily available tool for reporting comprehensive progress concerning all aspects of environmental activities. The voluntary adoption of the guidelines by a vast majority of the oil and gas companies increases transparency, credibility and comparability in sustainability reporting. Governments and professional bodies should support the adoption of these international reporting standards, and third-party assurance adds value or credibility to the reports of those companies that have adopted it. Our research is limited in that we adopted a case study approach, examining the reports of only a few companies; therefore, our conclusions may not be representative of the general group or population. In addition, during scoring, environment indicators can be fallible and may be some errors can occur by scoring activity that should not be scored, or omitting activity that should be scored.

Conclusion on the second chapter

The functioning of the EMS as a dynamic system is especially important in the implementation of investment projects in the oil and gas industry because it is connected with high-risk and environmental hazards, affecting virtually all components of the environment. The great length and scale of production facilities, such as pipelines, involve a wide range of groups and organizations whose interests are affected by start-up

and implementation of the investment cycle. The stage of construction makes different social and environmental impacts, as it includes a primary, destructive implementation of foreign technical systems in natural systems and well-established way of local people. This process brings a transition to the new man-made landscapes, and adaptation of the population to the new conditions. Design and creation EMS can prevent, reduce or minimize such effects at the preparation phase of the project.

In Russia the investment activity is one of the types of economic activity that is not supported by environmental legislation standardized requirements that take into account the specification of the preparation and implementation of investment projects, making it difficult to follow the provisions of the law.

Recommendations on the creation and implementation of environmental and social aspects management and EMS in the oil and gas investment projects:

- firstly, you need a standardized procedure for determining the areas of responsibility of the customer and contractors to ensure the environmental safety of oil and gas investment projects that would regulate the responsibilities of organizing EMS level of investment contracts and tender documents;

- secondly, you need a single methodological approach to the identification of environmental aspects of the project that will be used during the environmental impact assessment (EIA) on the construction and operational phases, and in the process of EMS at these stages;

- thirdly, organizational interaction between customer and contractors during the construction phase is fundamentally different from the operational phase, when constantly functioning operating organization works with the same initial list of environmental aspects and has the ability improve the EMS tools and reach significant results in improving the environment;

- fourthly, it is necessary to establish requirements for corporate monitoring and control functions from the customer that acquire a different structure and the importance of the implementation of investment projects.

The best way to the efficient functioning of the environmental management of investment projects can be defined as the management of environmental aspects, carried out at all stages of the project with the help of the environmental and social assessment through mechanisms of interaction with contractors and stakeholders. An important

condition of the organization of effective interaction is the regulatory and legal support at corporate and institutional levels.

Environmental Responsibility of Oil and Gas companies in Russia was conducted by the cooperative initiative by CREON Group and WWF Russia with participation of National Rating Agency.

The most visible trend of the rating held in 2016 comparing to 2015 is the growth of environmental responsibility and trasparency for most companies that can be seen on the Table 2. The three rating leaders are Sakhalin Energy, Gazprom, and Surgutneftegaz. Sakhalin Energy has improved its position from 2014 and 2015 and now is the leader of the final rating, while Gazprom and Surgutneftegaz lost one position each. The best rating dynamics were shown by Exxon NL, Total PPP, LUKOIL, and Zarubezhneft. Also, LUKOIL, and Zarubezhneft made public a large volume of information in the Internet sites and their subsidiaries.

Fundamental improvements in Russian environmental management require fundamental reshaping of Russian institutions. This includes establishing more competitive real-market relations rather than virtual economic ones, establishing a rule of law, decreasing corruption significantly, implementing a tax code that is transparent and does not penalize environmental compliance, and attracting foreign direct investments that provide management and technological improvements rather than what is often perceived to be second-rate technology and lower levels of environmental protection. It also likely requires instilling in businesses and individuals a sense of environmentally responsible behavior.

From the Table 3 we can see we found out that environmental review was done by 14 companies out of 21 (67%), 14 companies have environmental policies (67%), 15 companies have environmental programmes (71%), 13 companies have environmental management systems (62%), 13 companies held environmental audit (62%), 17 companies present their environmental statements (81%), and 12 companies have verification and registration (57%).

We evaluated the environmental practices of several oil and gas companies against the Sustainability Reporting Guidelines issued in 2006 by the Global Reporting Initiative (GRI), also known as ‘G3’.

Companies selected for this study were chosen by the following criteria: they are within oil and gas industry; they are top Russian companies, that participated in the Environmental rating held by the CREON group; they have made a formal commitment to consider the environment. The selected companies were: Sakhalin Energy Investment Company Ltd. (Sakhalin Energy-2), Gazprom, Surgutneftegas, LUKOIL, Salym Petroleum Development N.V. (SPD), Exxon Neftegas Limited, NOVATEK, Gazprom Neft.

Published environmental information was collected from the companies' sustainability reports (SR) or corporate social responsibility (CSR) reports. The main tool used for analyzing the published data was content analysis; we objectively and systematically identified specified characteristics of messages.

In our assessment of the eight oil and gas companies' environmental reports against the GRI indicators, their reported environmental performance was scored between 11 and 28 (out of a maximum score of 30). The highest level on environmental performance was showed by Sakhalin Energy (Sakhalin-2); the lowest by Gazprom Neft. The remaining companies scored between 12 and 24.

We found that the following three environmentally responsible practices were implemented: habitats protected and restored; monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations. By contrast we found that almost all companies disclosed information about: Percentage of products sold and their packaging materials that are reclaimed by category, possibly because this requirement is not applicable to them.

III GUIDELINES FOR IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT IN THE OIL AND GAS INDUSTRY

3.1 Environmental management tools and techniques

According to the data that is given in the tables above we picked the Russian oil and gas companies with the highest environmental performance. These companies are: Sakhalin Energy, Gazprom, Surgutneftegaz, LUKOIL, Salym Petroleum Development, Exxon Neftegaz Limited, NOVATEK, and GAzprom Neft. Their indicators allow us to look closer at the way of implementation of environmental management at these companies. Studying of the information given on the web sites of these companies gives us a chance to highlight the basic principles of environmental management that they have been using.

Publication of an environmental policy statement is only one part of a multi-stage process that companies undertake in order to assess their environmental performance and to manage their environmental impacts. Often companies also employ a range of tools that frequently draw on the management control practices used in other aspects of the firms' operations. Sometimes these practices are formalised as an explicit environmental management system. Though the EMSs of different organisations may be different widely in details, they usually include the following parts – henceforth referred to as the key elements: an environmental policy statement; an initial review; environmental objectives and targets; implementation procedures; internal monitoring and auditing; and internal reporting. For a company wishing to implement these elements it is important to establish and maintain a system of environmental management appropriate to the enterprise [OECD].

Some firms choose self-designed EMSs that are tailored to the individual company requirements and problems. Others use or adapt environment management standards. The advantages of tailor-made management systems on the one hand and standardised systems on the other have been discussed in relation with other areas of management, and there appear to be similar discrepancies with regards to EMSs. Standards may enhance the credibility of firms' environmental measures if the management standards are widely accepted, and standardised systems provide quick and relatively inexpensive access to advanced management techniques. On the other hand, a potential drawback of standardised systems is that they may not be entirely suited to individual company needs. The degree of coverage of environmental management system varies from company to company [Sadler].

Various tools have been developed to assist companies in implementing their EMSs, including Environmental Impact Assessment, Environmental Accounting and Auditing and Life Cycle Assessment. These tools may be employed for assessing and monitoring environmental impacts (impact assessment is mandatory in many countries), setting a course of action and providing means of communication. For instance, auditing is an important tool for assuring company managers of the accuracy of information and at the same time contributing to the external credibility of companies' environmental commitment.

Companies that have committed themselves to a high standard of environmental management also want to guard themselves against being tainted by possible shortfalls in the environmental performance of their suppliers and contractors. Supply chain auditing has therefore emerged, providing corporate buyers with comprehensive environmental information on the products, components or materials they produce [OGP, 1994].

Consistent with the regulations of the the Russian Federation and requirements of regulatory authorities, where applicable, site specific environmental and compliance documents should be prepared and submitted for each campaign prior to operations commencing, taking into consideration all relevant sensitivities and detailing special conditions or restrictions that apply. The operating company's environmental policy, management structure, procedures and compliance programme (and, where applicable, those of its contractors) should be included. Mechanisms to measure performance should be clearly outlined and designated liaison channels should be identified, as appropriate [OGP, 1994].

If we talk about operating in the Arctic territories regular and routine consultations should be arranged with the authorities and local communities including indigenous groups, fisheries committees, tourism and marine agencies to ensure full awareness of operating plans and programmes. Plans for such consultations should be prepared before operations start and should be included within a Stakeholder Engagement Plan, Communications Plan or similar document. Specific consultations may be required for the different phases of the petroleum life cycle [OGP, 1994].

While environmental management practices are becoming more widespread, the demand for high quality environmental reports is mounting. Companies are facing ever-greater pressure to publish a thorough report on their environmental performance, including quantitative information going back several years and reference to negative experiences. A company implementing the environmental management system should consider undertaking a certain amount of environmental reporting and provide the public and employees with adequate and timely information on the potential environment, health and safety impacts of the activities of the enterprise, and engage in adequate and timely communication and consultation with the communities directly affected [OECD].

An increasing number of oil and gas companies publish information on the environmental impact of their activities. However, in the absence of internationally agreed reporting standards, the content of such reports ranges from rudimentary pieces of information to full-scale sustainable development reporting. So, it is important to make information on environmental performance available to the public in the future, whether in a stand-alone environmental report or included in the company's annual report.

In the absence of an agreed standard for environmental reporting, oil and gas companies make their own choices as regards the scope and depth of their reporting. Four indicators of differences between the contents and scope of existing environmental performance reports are: the publishing of quantitative data; whether performance is compared with targets, whether the report is verified by a third party; and whether the report includes environmental cost accounting.

If a company's environmental performance report is to be comparable with those of other companies (and with the company's own past) it is essential that quantitative information is made not only public but also that data is presented in a comparable way, i.e. reporting on same indicators, same units and presenting accurate data. The majority of the companies that were examined in this study do include this data in their performance reports.

An interesting development over the last years has been a tendency for companies to highlight the economic value of their environmental efforts and the business integration of their environmental management systems. One of the visible results has been a co-evolution of environmental performance reporting with environmental cost accounting – that is accounting for the financial and non-financial costs and benefits of pursuing a company's environmental policies.

Companies face public expectations that they take steps to ensure the adequacy of arrangements for the health and safety of their employees, and the effectiveness of these arrangements is an important contributor to the overall safety performance of the company. Over the years, these efforts have become progressively more formalised and structured through the introduction of legislation, the application of risk assessment and audit procedures to a widening range of hazards, and the development of standards and guidance. The issue of occupational health and safety is

important for the implementation of the EMS, not least as several of the environmental provisions of our study refers to companies' responsibility to uphold environment, health and safety standards as closely related issues. Oil and gas companies should maintain contingency plans for preventing, mitigating and controlling serious environmental and health damage from their operations [OECD].

Like environmental management systems, occupational health and safety systems come in two shapes, namely off-the-shelf standards and systems tailored to individual companies. However, a comprehensive occupational and safety system commonly includes the following elements: the formulation of an occupational health and safety policy; the identification of risks and legal requirements; objectives, targets and programmes that ensure continual improvement; management activities to control occupational health and safety risks; monitoring of the system's performance; and continual reviews, evaluation and improvement of the system.

Considering the significance of sound environmental management we are now in agreement that that environmental management is worth investing. Now there is a need for a company or an organization to know how to go about it. In order to undertake any task one needs appropriate tools. This chapter describes a range of environmental management tools - tools that a company or an organization can use to effectively manage its environmental and social affairs.

There is a set of certain tools that remain usuful and efficient for all kinds of companies, these tools include: environmental management systems, environmental auditing, environmental labeling, life cycle assessment, environmental indicators, environmental policies, eco-balances, environmental reporting, environmental charters.

According to the practicies of the oil and gas companies that gained the top places in out ratings we can identify certain requirements for developing an EMS. In order to develop an EMS that meets the requirements a company must take the following steps:

- first it must produce an environmental policy that contains commitments to legislative compliance and to continually improving its environmental performance;

- next it must set targets relating to these commitments and devise a programme for meeting these targets. Targets for improving environmental

performance should be based on a comprehensive review of its environmental activities;

- it must then take the measures necessary to implement the programme;

- having implemented the programme, it needs to check that it has been successful in meeting its targets. Corrective action must be taken in instances where this is not the case. The EMS must be audited periodically to check it is functioning as it should;

- finally, the firm needs to carry out a management review of the EMS, making any changes necessary in light of the audit results and changing circumstances. Having met its first set of targets the firm must set itself a new set of targets so as to meet its policy commitment to continual improvement.

Environmental auditing is a tool for checking whether a firm or an organization is doing what it should be doing. For instance a legislative compliance audit checks that those activities of the firm covered by environmental legislation (i.e. what it is doing) actually comply with that legislation (i.e. what it should be doing). An environmental audit will tell a firm or an organization whether its waste management practices (i.e. what it is doing) conform with the industry sector best practice guidelines it has committed itself to following.

Environmental indicators allow a firm to measure both its environmental performance and its efforts to improve its performance. Indicators can be used within an environmental management system to check that a firm has met the targets it is required to set for itself, but can equally well be used in firms that have not developed an EMS.

A company eco-balance records the various raw materials, energy, resources, products and wastes entering, held within and leaving a company over a specified period of time. In other words, it provides a record of a company's physical inputs, stock and outputs. Once a company knows exactly what is coming in and going out, it can begin to assess the particular environmental impacts of those inputs and outputs. An eco-balance therefore enables a firm to undertake the comprehensive environmental review of its activities required by ISO 14001 and EMAS and to go on and set targets for improving its environmental performance [Sadler].

Life cycle assessment (LCA) is a tool for identifying and assessing the various environmental impacts associated with a particular product. LCA takes a "cradle to grave" approach looking at the impacts of the product throughout its life cycle i.e. from the raw materials acquisition (the "cradle") through its production and use to its final disposal (the "grave"). LCA allows manufacturers to find ways of cost-effectively reducing the environmental impact of a product over its life-cycle and to support their claims about the environmental impact of their products [Sadler].

Environmental labeling schemes award an environmental label to those products that are judged to be less harmful to the environment than others within the same product group. Firms that wish for their products to be considered for a label must apply to the scheme organizer. To be awarded a label, a product has to meet a set of environmental criteria drawn up for its product group by the labeling scheme organizer. The criteria relate to the complete product life-cycle and are drawn up using LCA. They are set so that only a certain percentage of products within a group, say 20-30%, can meet them. Hence environmental labels can be used as marketing tools as they signify that a product is one of the least environmentally harmful products in its group [Sadler].

Having undertaken various environmental management initiatives to improve its environmental performance, an oil and gas company may wish to communicate the results of these initiatives to the outside world. One way of doing this is by publishing an environmental report. Issuing an environmental report can improve a firm's public image and lead to improved relationships with stakeholders. To date, it is mainly large companies that have issued such reports but small and medium scale companies may also find environmental reporting a useful tool.

There are a number of environmental charters and guidelines to which a firm/company or an organization can subscribe in order to demonstrate its commitment to responsible environmental management [Sadler].

Producing a policy is an important first step towards achieving effective environmental management. Setting out your aims and intentions with respect to the environment is an important first step towards achieving effective environmental management. Having done this, a company can then take the

measures necessary to achieve them. By taking appropriate measures i.e. by carrying out effective environmental management, a company can gain the benefits that such management brings.

An environmental policy provides important information to external stakeholders on company's aims and intentions with respect to the environment. Having an environmental policy can enhance company's reputation with external stakeholders such as customers and the local community. It shows that an organization have made a start on dealing with environmental performance. However, to make sure a company's reputation isn't tarnished in any way, it is important that all stakeholders see evidence that a company is taking action to realize the aims and intentions set out in environmental policy.

Large organizations are becoming increasingly concerned to ensure that the environmental management of their suppliers is of an acceptable standard, and it is absolutely true about companies working in the oil and gas industry. It is therefore becoming increasingly common for such organizations to require that their suppliers have an environmental policy. As a responsible company, a company may not have the luxury of sitting back and deciding whether or not it wishes to produce an environmental policy. If a major customer requires a company to produce a policy, it will need to do so or risk losing business. Rather than waiting until they are asked, it makes sense to prepare a policy in its own time. That way a company is prepared for any customer that requires it to have one.

Before a company begins to develop a policy it is important to get the backing of the company's senior and executive management. This will help to ensure that the policy is effectively implemented once it has been written. One way of making management's commitment visible is to have the policy signed by, for instance, the company chairman/women and/or the chief executive officer/managing director. There are a number of sources of useful information that could be used when developing a policy: Other companies' environmental policies, company's employees, other relevant stakeholders, environmental management system schemes, environmental charters.

An environmental policy is a broad statement of aims and intentions. In order to achieve these, a company may wish to set itself detailed objectives and

targets. However these are generally not included in the policy document itself. In the beginning, a company may not have done the necessary investigation into its environmental activities to be in a position to formulate objectives and targets. And even if it has, the fact that there may be a large number of such objectives and targets and these will change from year to year, would mean that including them in the policy document would make it unnecessarily long and complicated. It is best to separate the statement of aims and intentions from the specific measures a company intends to implement in order to realize them.

Having developed the environmental policy, it is important to ensure that all key stakeholders receive copies. These stakeholders may include customers, suppliers, shareholders, regulators and key persons and organizations in the local community. A company should also be ready to post out the policy to those people that hear about it and approach you for a copy. One can also publish the policy in the company's annual report and website, and all staff should receive a copy of the policy and the company should ensure that all staff understands the policy and their role in implementing it.

It would be wrong to view the production of an environmental policy as an end in itself. A policy has to be implemented i.e. action has to be taken to achieve its aims and intentions. If a company's policy is to become a practical reality, a company will need to: be familiar with those elements of its activities, products and services which affect the environment; set itself specific objectives and targets relating to these elements especially those that have or could have a significant impact on the environment. The aim here is to find ways of improving its environmental performance that also improve its business performance; take action to meet these objectives and targets; measure its environmental performance to check its objectives and targets have been met.

To do this, it will be necessary for a company to manage its environmental affairs in a systematic way. The following sections describe various environmental management tools that will allow a company to do this and so gain the benefits that such management can bring.

3.2 Application of environmental management system

The elements of ISO 14001 that is broadly applied in the companies which received the highest points in our ratings are organized around 5 initial steps, each of which is briefly described below.

Step 1 - Environmental policy

A firm drafts a policy setting out its intentions in relation to the environment. The policy must contain commitments to: continual improvement, prevention of pollution, compliance with relevant environmental legislation and other legal requirements. ISO 14001 defines "continual improvement" as the process of enhancing the environmental management system in order to achieve improvements in environmental performance in line with the organization's environmental policy.

Step 2 – Planning

The firm must then set itself objectives and targets relating to its policy commitments and devise a plan to meet these objectives and targets.

At step 2 the firm must do is to identify what the standard calls its 'environmental aspects'. These are defined as, 'elements of an organization's activities, products or services which can interact with the environment'. Once its environmental aspects have been identified, the firm must establish which of them are 'significant' i.e. which of them have a significant impact on the environment. To identify its significant environmental aspects, the firm needs to undertake an 'environmental review'. It should be emphasized that the environmental review is the foundation upon which the rest of the management system is built and should be conducted as thoroughly as possible.

Given that the firm has made a commitment in its policy to comply with legal and other requirements, the firm must establish what these actually are. This is done during the environmental review. The firm should consider how it can keep track of changes in legal requirements so it can remain in compliance.

In order to meet its commitment to legal compliance a firm must set itself the objective of identifying and correcting any non-compliance. In order to meet its policy commitment to continual improvement and prevention of pollution, the

firm must set objectives and targets in relation to its significant environmental aspects.

Having set its objectives and targets the firm must now devise a programme for achieving them. The programme must state the time-frame in which the objectives and targets are to be achieved and identify the people responsible for achieving them.

Step 3 - Implementation and operation

Having devised its plan, the firm must then put in place the various elements necessary for its successful implementation and operation.

At step 3 role, responsibility and authority of everyone involved with the EMS must be defined. Management must provide the resources necessary for the implementation of the EMS. (Resources include human resources, technology and financial resources). The firm's management must appoint someone who is ultimately responsible for ensuring that the EMS is established, implemented and maintained in accordance with the requirements of ISO 14001.

All staff whose work may create a significant impact on the environment must receive the appropriate training. The firm must make them aware of: the importance of conformance with the requirements of the EMS; the significant environmental impacts of their work activities and the environmental benefits of improved personal performance; their roles and responsibilities in the successful functioning of the EMS.

Staff performing tasks which can cause significant environmental impacts must be deemed competent to do so. (Competence is assessed on the basis of their education, training and/or experience).

The firm must establish and maintain suitable procedures for communication between various parts of the firm regarding the EMS. It must also make provisions for receiving and responding to relevant communications about its EMS from external parties.

The firm must establish and maintain information in paper or electronic form to: describe the elements of the management system and their interaction, provide direction to related documentation.

The firm must establish procedures for controlling all the documents required by ISO 14001 to ensure, for instance, that they can be located and that they are periodically reviewed, revised as necessary and approved by authorized personnel.

The firm is required to identify those of its activities that are associated with the significant environmental aspects covered in its objectives and targets. The firm then needs to produce documented operating procedures for these activities to cover situations where, if no procedures existed, the objectives and targets might not be met.

The firm must also establish procedures relating to the significant aspects of goods and services used by the organization. All relevant procedures must be communicated to suppliers and contractors.

The firm must establish and maintain procedures: to identify potential accident and emergency situations, to respond to these situations should they arise, and for preventing and mitigating the environmental impacts that may be associated with them. The firm must periodically test these procedures where practicable and review and revise them where necessary particularly after the occurrence of accidents or emergency situations.

Step 4 - Checking and corrective action

Having implemented its plan, the firm must then check to see it has been successful in meeting its objectives and targets. If any have not been met, then corrective action must be taken. The entire management system must be periodically audited to see that it meets the requirements of the standard.

At step 4 firm must establish and maintain documented procedures to monitor and measure on a regular basis, those areas covered by the objectives and targets in order to see if the objectives and targets have been met. The firm must also establish and maintain a documented procedure for periodically evaluating compliance with relevant environmental legislation and regulations.

The organization must establish and maintain procedures for the identification, maintenance and disposal of its environmental records. These records must include training records, the results of audits and management reviews.

The firm is required to establish and maintain a programme and procedures for periodic environmental management system audits to be carried out. The audit

seeks to determine whether or not the EMS: conforms with the requirements of the ISO 14001; has been properly implemented and maintained.

The audit programme and procedures should cover: the activities and areas to be considered in audits, the frequency of audits the responsibilities associated with managing and conducting audits, the communication of audit results, auditor competence, how audits will be conducted.

Step 5 - Management review

The firm's management must periodically review the environmental management system to ensure it continues to meet the needs of the firm. The review must address the possible need for changes to the firm's policy, objectives and other elements of the environmental management system in light of the following: the audit results, changing circumstances, and the firm's commitment to continual improvement.

The commitment to continual improvement and prevention of pollution will mean that new objectives and targets will have to be set and changing circumstances, for instance, the introduction of new products and processes, will mean that new procedures need to be written and new roles and responsibilities designated.

Not just anyone can verify that a firm's environmental management system and environmental statement meet the Regulation's requirements. The verification must be done by an independent accredited environmental verifier.

The oil and gas industry designs its facilities for extremes of weather in areas where it operates and this is also true for Arctic conditions. As it pursues its Arctic strategy, the oil and gas industry is monitoring closely the future changes in the Arctic and will adopt appropriate practices to ensure safe design for foreseeable conditions [OGP, 2002].

New economic enterprises have emerged and now dominate the Arctic industrial landscape. These are typically the mineral resource based industries that include oil and gas development and mining. These enterprises are highly capital intensive, large scale and have their decision-making centralised in centres far removed from the local peoples of the Arctic [OGP, 2002].

Physical conditions in the Arctic with regard to oil and gas development are changing. Changes in weather and oceanographic patterns have had consequences over various timescales for example for sea ice cover, sea level, iceberg calving, coastal erosion and permafrost integrity. Seasonal loss of ice cover has been projected on various time scales. Changes in the maritime environment have implications for the construction and operation of offshore facilities, and the associated export routes for hydrocarbons. Changes to the terrestrial environment may influence the construction and operation of landbased facilities [OGP, 2002].

Examples of arctic challenges: remote location; changing ecology; icebergs; prolonged darkness; mobile pack ice; severe storms; permafrost; earthquakes; sensitive environment; deep water; climate change; short operating season [OGP, 2002].

Traditionally, Arctic peoples lived seasonally or permanently in small settlements. However, since the arrival of Europeans and other non-aboriginal groups, there has been a steady migration from smaller settlements into larger centres. For example, in Alaska, over a third of the population of that State now lives in and around Anchorage. Despite the growth in urban centres, a percentage of Arctic people still reside in smaller communities and practise a subsistence lifestyle based on hunting and trapping, whaling, f ishing and reindeer husbandry [SDWG].

Other sources of jobs and income include tourism, which is growing in many regions of the Arctic. Originally tourism was based on sport hunting and f ishing but this has now expanded to ecotourism. Other contributions to the local economy may come from the sale of traditional arts and crafts [OGP, 2002].

While people are connected to the modern market economy by cash and wages, they still rely heavily on traditional lifestyles, acquiring food from the land and sea, sharing and bartering food and other goods and services. Hunting, fishing, herding and gathering continue to be of major significance to indigenous peoples of the Arctic in providing food, social relationships and cultural identity [OGP, 2002].

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Oil and gas exploration and development can involve power generation, transportation and infrastructure development, together with the consequent influx of people. The intensity of such activity can produce a variety of primary, secondary and cumulative effects which vary with time and distance from the development site. Effects may sometimes be far removed from the source, for example by contamination of seasonal watercourses, or by changes in land-use, caused by access routes. It is important to consider immediate, short-term primary impacts as well as long-term, secondary and cumulative impacts from separate, but linked operations[OGP, 2002].

At each stage in the development of an oil and gas exploration and production project, there are specific procedures and actions that can be implemented to prevent potential harm to the environment and minimise unavoidable impact[OGP, 2002].

Oil and gas companies now place considerable emphasis on building partnerships and integrating stakeholder concerns into the overall project management cycle. Industry Associations at international level (eg OGP, IPIECA) and at country level (national oil industry associations) have an important role in representing their respective membership in industry discussions with major stakeholders. These associations are also able to advise members on key stakeholders [OGP, 2002].

At an early stage, operators who intend to be active in the Arctic should identify the relevant pan-Arctic and local stakeholders who are likely to have interests or concerns, who may be a source of reliable data and who may have input on likely hazards and risks. An operator should endeavour to understand the goals and needs of each stakeholder group and the communications methods that will be appropriate for each, with due regard for the distances, remote locations, seasonal activities and languages of the Arctic people. A Communications Plan, including Stakeholder Engagement, can provide a useful strategic guide for the operator’s personnel.

Within the Arctic regions, the operators must take into account the special needs of indigenous peoples and should refer to industry guidance in establishing their engagement strategy [IPIECA].

Exploratory drilling operations produce a variety of discharges, wastes and emissions. The primary discharges include: drilling muds and cuttings; cementing wastes; wash water; well completion and stimulation fluids; and production testing wastes. Associated solid and domestic wastes include excess drilling chemicals and containers,

construction materials (pallets, wood, etc), process water, fuel storage containers, power unit and transport maintenance wastes, scrap metal and domestic and sewage wastes. By volume and weight, spent drilling mud and cuttings comprise the majority of the waste and effluent produced [IPIECA].

The effective management of all emissions and discharges begins with pollution prevention. Pollution prevention refers to the elimination, change or reduction of operating practices that result in discharges to land, air or water. This principle should be incorporated into the design and management of E&P facilities and the planning of associated activities. If elimination of a discharge is not possible, then minimising the amount of waste or effluent generated should be investigated. Responsible discharge management may be accomplished through hierarchical application of the practices of source reduction, reuse, recycling, recovery, treatment and responsible disposal [IPIECA].

Operators should incorporate adequate preventive measures and systems to deal effectively with minor operational incidents. Maintaining effective response plans and spill response capabilities is essential. The response plans should be based on the risk, location, seasonal conditions, volume and type of potential spill. Most oil spills from offshore oil and gas facilities are small and are often handled locally. If the spill is such that it cannot be handled locally, then an enhanced response is required. This enhanced response could be part of a district, national or regional plan, but all plans should follow a similar layout and ensure a smooth transition from one level to the next. This is often referred to as a tiered response. By design, additional tiers are activated as the capability of each tiered response is exceeded [IPIECA].

Response strategies will be determined by the prevailing environmental conditions at the time of the incident.

An incident assessment and reporting process should be implemented. The process should review, analyse and document the situation, including conditions, progress and prognosis, and should focus on the following where appropriate: status and safety of personnel, including safety on ice; status of facility and source; site assessment; weather conditions (light, air and water temperatures, wind speed and direction, and tides, if appropriate) [IPIECA].

After studying all the information that was published by the oil and gas companies themselves and the conclusions that were made in the previous chapters we can evaluate the steps for establishing and implementing an EMS at the oil and gas companies some of which may also work in the Arctic:

1. Obtain commitment from top management.
2. Define responsibilities, appoint management representative(s), establish EMS steering committee, develop implementation plan, and undertake initial training on EMS.
3. Undertake an initial environmental review (optional).
4. Identify environmental aspects, legal and other requirements; determine significant aspects; formulate environmental policy; establish environmental objectives, targets and programs; estimate the possible environmental risks.
5. Implementation and operation - develop documentation and processes.
6. Develop processes for monitoring, measurement, corrective and preventive action.
7. Develop and deliver EMS training within the organisation.
8. Establish an internal audit program, including training; conduct initial internal audit to evaluate conformity to requirements of ISO 14001, including evaluation of compliance.
9. Follow up internal audit with improvements to system.
10. Conduct initial management review of EMS.
11. Implement improvements from management review.

Step 3 (initial environmental review) may provide benefit to an organisation looking at environmental management for the first time and usually covers the following: identification of environmental aspects; identification of legal requirements and other requirements to which the organisation subscribes; examination of existing environmental management activities, controls and procedures, including those associated with procurement and contracting; evaluation of previous emergency situations and accidents.

Conclusion on the third chapter

According to the data that is given in the tables above we picked the Russian oil and gas companies with the highest environmental performance. These companies are: Sakhalin Energy, Gazprom, Surgutneftegaz, LUKOIL, Salym Petroleum Development,

Exxon Neftegaz Limited, NOVATEK, and GAzprom Neft. Their indicators allow us to look closer at the way of implementation of environmental management at these companies. Studying of the information given on the web sites of these companies gives us a chance to highlight the basic principles of environmental management that they have been using.

Various tools have been developed to assist companies in implementing their EMSs, including Environmental Impact Assessment, Environmental Accounting and Auditing and Life Cycle Assessment. These tools may be employed for assessing and monitoring environmental impacts (impact assessment is mandatory in many countries), setting a course of action and providing means of communication. For instance, auditing is an important tool for assuring company managers of the accuracy of information and at the same time contributing to the external credibility of companies' environmental commitment.

Like environmental management systems, occupational health and safety systems come in two shapes, namely off-the-shelf standards and systems tailored to individual companies. However, a comprehensive occupational and safety system commonly includes the following elements: the formulation of an occupational health and safety policy; the identification of risks and legal requirements; objectives, targets and programmes that ensure continual improvement; management activities to control occupational health and safety risks; monitoring of the system's performance; and continual reviews, evaluation and improvement of the system.

There is a set of certain tools that remain usuful and efficient for all kinds of companies, these tools include: environmental management systems, environmental auditing, environmental labeling, life cycle assessment, environmental indicators, environmental policies, eco-balances, environmental reporting, environmental charters. The elements of ISO 14001 that is broadly applied in the companies which received the highest points in our ratings are organized around 5 initial steps: developing and environmental policy, planning, implementation and operation, checking and corrective action, management review.

The oil and gas industry designs its facilities for extremes of weather in areas where it operates and this is also true for Arctic conditions. As it pursues its Arctic

strategy, the oil and gas industry is monitoring closely the future changes in the Arctic and will adopt appropriate practices to ensure safe design for foreseeable conditions.

After studying all the information that was published by the oil and gas companies themselves and the conclusions that were made in the previous chapters we evaluated the steps for establishing and implementing an EMS at the oil and gas companies some of which may also work in the Arctic.

Conclusions

This study explores the ways of implementation of environmental management system at the Russian oil and gas enterprises. This thesis contributes to a better understanding of this system by providing calculation model to evaluate the most environmentally friendly oil and and gas companies in Russia, and it evaluates the ultimate way of implementation of EMS at the companies which also may work in the Arctic.

The study shows that the top companies of our rating have increased their environmental performance and energy efficiency during the recent years. It also shows that the environmental management system has acted as a means for environmental responsibility by improving employees' knowledge about process with significant environmental impact and led to identification and evaluation of environmetal risks in the companies' production. EMS has led to some upgrades of production equipment, which has contributed to increasing energy efficiency.

Regarding the social aspects, it was found that the companies' EMSs act as a means for social responsibility by increasing the employees training and education in health and safety issues which helps to develop staff and minimise risks.

In the area of economical responsibility, this study has a limited amount of data. However, since economical responsibility is about dealing with environmental aspects in an economical manner, for example eco-efficiency. This thesis shows that companies have managed to increase the efficiency of their resources that makes them economically responsible and focusing on the increse of their income.

Sonce the companies have reduced their environmental impact and energy consumption and supported better social practices, the implementation of EMS can be seen as a contributing factor towards companies' progress and sustainable development. The increasing environmental performance also tells us about the preparedness of the major Russian oil and gas companies to start oil and gas exploitation in the Arctic.

The main goal of our study was the evaluation of an ultimate implementation of environmental management at the oil and gas companies, and so this goal has been achieved. The basic steps are:

1. Obtain commitment from top management.
2. Define responsibilities, appoint management representative(s), establish EMS steering committee, develop implementation plan, and undertake initial training on EMS.
3. Undertake an initial environmental review (optional).
4. Identify environmental aspects, legal and other requirements; determine significant aspects; formulate environmental policy; establish environmental objectives, targets and programs; estimate the possible environmental risks.
5. Implementation and operation - develop documentation and processes.
6. Develop processes for monitoring, measurement, corrective and preventive action.

7. Develop and deliver EMS training within the organisation.

8. Establish an internal audit program, including training; conduct initial internal audit to evaluate conformity to requirements of ISO 14001, including evaluation of compliance.

9. Follow up internal audit with improvements to system.

10. Conduct initial management review of EMS.

11. Implement improvements from management review.

We also would like to note that the lack of available data for some of the studied variables. Some companies had good and open disclosure on mostly all variables that this thesis looked into, and some were rather undisclosed on all parts. One could argue that this could lead to a gap in the validity of the information presented in this thesis, but we would like to stress the importance of "no reference" in this sense. The topic is Environmental Management Frameworks in the Oil Industry, and though not addressed much in this thesis, part of what could be seen as relevant is transparency in environmental disclosure. As the main methodological part of this thesis was to collect disclosed data related to EMS.

When it comes to the categories selected, we do recognize alternative and other categories that could have been used for the study. For this thesis relatively specific categories and variables were selected because of the comparative needs in relation to the aim of the paper. If more non-specific categories were selected it would have been compromising the comparability. As an example it is worth mentioning how companies often publish highlights of their EMS performance and structure.

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